Evaluation of Alfalfa (Medicago sativa) and Sericea Lespedeza (Lespedeza cuneata) to Improve Animal Performance in a Tall Fescue-Based Grazing System

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Abstract: Tall fescue [Schedonorus arundinaceus (Schreb.) Dumort. nom. cons. Lolium arundinaceum (Schreb.) Darbysh.] is the dominant pasture grass across much of the southeast of the USA. The species is productive, but grows slowly in summer. Plants also harbor an endophytic fungus (Epichloe coenophiala), which produces alkaloids that are toxic to cattle. Adding summer-productive forages to fescue-based systems may benefit animal production by providing extra herbage and diluting fescue toxins. A three-year study was conducted in Virginia, USA to determine animal and vegetation responses when alfalfa (Medicago sativa) or Sericea lespedeza (Lespedeza cuneata (Dum. Cours.) G. Don) swards were established into tall fescue pastures. Average daily gain (ADG) of steers and seasonal herbage mass dynamics were monitored from 2016 to 2018. Forage and weed species composition measurements were collected to address a secondary objective that sericea might suppress weeds through allelopathy. Steer performance was acceptable (0.73 kg d⁻¹ ADG), but interseeded legumes did not improve weight gain. Steers avoided sericea plants, and this resulted in greater herbage mass accumulation in summer compared with other treatments. Alfalfa was selectively grazed and cover decreased to almost zero by year 3, while sericea cover increased to over 82%. We found little evidence that sericea was allelopathic against weeds. Neither summer-productive legume species proved to be satisfactory in improving summer animal performance in this tall fescue-based grazing system.

Keywords: tall fescue; alfalfa; sericea lespedeza; grazing; steers; summer forage

1. Introduction

Tall fescue, a forage grass commonly grown in the southeast of the USA, is usually infected with an endemic endophytic fungus, Epichloe coenophiala [1,2]. Presence of the endophyte and associated ergopeptide alkaloids that it secretes improves stress tolerance of tall fescue [3], making it highly desirable for livestock producers. These compounds negatively affect ruminant animals, however, and are manifested as a syndrome called fescue toxicosis [4–6]. Estimates suggest that 90% of tall fescue pastures in the southeast are endophyte infected and, while the economic impact of fescue toxicosis is difficult to quantify, it is expected that the disorder may cost the U.S. livestock industry up to $2 billion a year [7].

Pastures can be managed to improve animal performance, reduce fescue toxicity, or both. Incorporating legumes such as red (Trifolium pratense) and white clover (T repens) into a tall fescue pasture [8] has been a long-standing recommendation and is one of the simplest methods for improving pasture nutritive value. Clover intake may help to dilute dietary toxin intake and thus reduce toxicity to livestock [6]. Some research indicates that the benefit for animal gains may be largely a nutritional (rather than a dilution) effect [9], but newer evidence suggests that there may be species-specific benefits on the basis of isoflavones countering toxin effects [10,11]. Despite such promise, managing clovers can
also be challenging in the southeast as they do not grow well in hot weather or when rainfall is lacking [12]. Additionally, because of their high palatability to livestock, clovers tend to be grazed selectively [13,14], which may reduce their abundance and hamper any long-lasting toxicity suppression. Thus, it would be useful to find well-adapted, grazing-tolerant alternative perennial legume species for the fescue systems in the southeast to boost forage productivity and help reduce fescue toxicosis. From that perspective, alfalfa and sericea lespedeza, two potential alternative legumes for the southeast, hold particular promise as productive legumes for warm-season production.

Although alfalfa is a cool-season species and produces more biomass in spring, it remains quite productive during summer because it can access water lower in the soil profile given its deep taproot [15]. Research suggests that poor soil fertility limited alfalfa use in pasture systems in the southeast. However, lack of grazing tolerance [16] and concerns over bloat [17] more broadly have probably limited the use of alfalfa for only grazing purposes across the USA. These attitudes have begun to change with the advent of grazing-tolerant cultivars [16] and bloat-reduced alfalfa is also on the market [18]. Studies of alfalfa combined with tall fescue systems are even more limited in the southeast of the USA, but data from an arid environment (UT, USA) indicate that alfalfa + fescue systems can support greater gain than a fescue monoculture [19]. Other work has shown that animals with access to adjacent monocultures of alfalfa and fescue altered grazing behavior and a partial preference for alfalfa over fescue [20,21] and that providing alfalfa in adjacent monoculture alfalfa supports greater gains on pasture which carry through the finishing phase [22].

Sericea lespedeza (hereafter sericea), a perennial, warm-season legume, was originally introduced into the USA as a species suited for summer production and well adapted to the acid, infertile soils in the southeast [23,24]. The species has spread throughout and beyond the region since its introduction in the 1800s [25]. Sericea has forage potential, but it can also contain a high concentration of condensed tannins and lignin, particularly when mature, and this can reduce palatability to livestock [26,27]. Selection efforts stretching back to the 1970s have produced improved several ‘low-tannin’ forage cultivars, with ‘AU Grazer’ currently the most prevalent [28]. Sericea has some desirable characteristics as a forage as it is productive, drought and heat tolerant, persistent in low-fertility soils, and may improve soil fertility from moderate levels of N fixation [29]. Additionally, the condensed tannins (proanthocyanidins) in sericea may actually benefit ruminants in several ways. Ruminants that consume legumes containing condensed tannins may exhibit improved protein utilization, reduced gastrointestinal parasite loads, and less bloat [30–33]. Condensed tannins inhibit methane and ammonia production in the rumen [34], which, in addition to benefitting animal production, can help reduce methane-related greenhouse gas emissions as well.

The condensed tannins in sericea may also benefit livestock by reducing the severity of fescue toxicity. The alkaloids that make tall fescue toxic to ruminants are protein-like, whereas the tannins are high-molecular-weight compounds that are not absorbed through the rumen wall and have a high affinity for binding to protein [34]. The strong binding capacity of condensed tannins to nitrogen-based compounds is hypothesized to make alkaloids in tall fescue less available in the gastrointestinal tract, thus reducing their toxic effects in ruminants [32]. Several grazing studies have shown that animals supplemented with tannins or tannin-containing legumes tend to eat more endophyte-infected fescue [35–37], suggesting that tannins have a detoxifying effect that would benefit animal performance. However, forage tannin concentration is likely to be an important consideration as high levels of available condensed tannins can depress forage intake [38].

To test the hypotheses that adding alfalfa or sericea to tall fescue pastures in adjacent monocultures would increase animal productivity in summer, we conducted a grazing study over three summers. The research had two major objectives: (1) to evaluate animal performance and (2) to quantify seasonal herbage mass dynamics in tall fescue swards planted with either tannin-containing (sericea) or nil-tannin (alfalfa) legumes. A third
objective involved documenting changes in forage species composition and weed pressure to gain observational evidence that sericea might exhibit allelopathic effects as has been reported in other studies [25,39].

2. Materials and Methods

The grazing experiment was conducted between 2016 and 2018 at the Virginia Tech Shenandoah Valley Agricultural Research and Extension Center (SVAREC) near Steeles Tavern, VA (37° N, 79° W). The soils at the site are primarily Frederick silt loam, with Frederick–Watahala complex on the northwestern side of the site. The slopes are approximately 3% to 8%. Climate is considered temperate, with an annual mean air temperature of 17 °C, a low mean air temperature of 4.7 °C in January and a high mean air temperature of 28.5 °C in July. Precipitation peaks between May and September and has an annual mean of 987 mm (Southeast Climate Center, https://sercc.com/state-climate-data; accessed on 10 January 2022). A weather station maintained by USDA-NRCS was located at the study site, but there were significant gaps in the growing season precipitation data collected from 2016 and 2017, so weather data were not presented in this paper. Based on previous studies at this site [40], precipitation and temperatures were near normal, and we observed no exceptionally unusual weather during the present study. Lastly, soil fertility was adjusted for pH, macro and micronutrients in 2014 based on Virginia Tech Soil Testing Lab standard recommendations.

The ~10 ha study site consisted of 24, 0.4 ha paddocks. Three forage treatments were assigned to paddocks in a completely randomized design with eight replications. The treatments included a monoculture of tall fescue (TF) or tall fescue planted with either alfalfa (ALF) or sericea (SL). Prior to this study, existing vegetation at the study site consisted of mostly tall fescue and orchardgrass (Dactylis glomerata) pasture used in grazing experiments. This existing vegetation was killed using glyphosate in May 2014 and planted with a cover crop of millet (Pennisetum glaucum), which was mechanically harvested in August that year. After another treatment of glyphosate in early September, tall fescue seed was planted into the designated paddocks at a rate of 11 kg/ha using a no-till drill. In the original experimental design, two tall fescue types were planted into plots—endophyte-infected tall fescue (KY31) and nil-ergot, non-toxic endophyte-infected tall fescue (Jessup, MaxQ®, Walnut Creek, CA, USA). Subsequent endophyte analysis of fescue plants the following year indicated low infection levels in the KY31 swards (<10%). Given the low endophyte status of the KY31 plots, we decided to combine the tall fescue treatments—effectively treating them all as nil-ergot, non-toxic fescue.

The alfalfa (ALF) and lespedeza (SL) treatments were established the following spring (2015). In March, a strip representing 30% of the paddock area was sprayed with glyphosate to kill existing fescue. One month later, sericea (cv. ‘AU Grazer’) or alfalfa (cv. ‘Ameristand 403T’) seed was drilled into the strips at 33 and 19 kg ha$^{-1}$, respectively. AU Grazer was the first sericea variety bred for grazing tolerance but has greater concentrations of condensed tannins than newer releases. Ameristand 403T was released as a traffic-tested, grazing-tolerant variety.

Forage treatments were grazed by weaned steers (7–8 months old) for three growing seasons, 2016–2018. Each year, two steers were assigned to each plot based on weaning weights such that total live weights were approximately equal across replicates. Different steers were used each year of this study. Plots were grazed continuously starting the first week of May and continuing through late August–early September. Grazing was stopped and the experimental season was concluded when herbage mass became limiting (~1000 kg/ha) on several of the plots.

2.1. Measurements
2.1.1. Animal Performance

Steers were weighed three times each grazing season at an adjacent weighing facility to evaluate animal performance. Animals were weighed at the start of each grazing season
(May), mid-summer (first week of July), and when we removed animals from the plots at the end of each grazing season. One weight per animal was taken at each time point. Average daily gain (ADG; kg per head day⁻¹) was calculated for each time interval.

2.1.2. Herbage

Herbage biomass was collected each month from May to September with a walk-behind forage harvester (Swift Machine and Welding, Swift Current, SK, Canada). Two harvest strips approximately 3 m in length and 1 m in width were cut from each plot in haphazard locations. In plots containing legumes, one harvest strip was taken from the fescue area and one from the legume area. Strip lengths were measured and recorded and the clipped forage was weighed wet. To estimate herbage mass on a dry wt. basis, an ~100 g subsample was collected from the mowed strip and dried in a forced draft oven for 48 h. (60 °C). Total harvested dry matter was then calculated for each strip area, and dry strip weights were used to estimate standing biomass yield per hectare for each pasture. Herbage mass samples were not collected in September 2018. In addition to herbage mass, sericea leaf tissue samples were collected and analyzed for total condensed tannin concentrations for descriptive purposes. Samples were collected from 10–15 randomly selected plants near peak biomass (August) in 2017 and 2018 and analyzed at Utah State University using methods according to [41].

2.1.3. Forage Species Composition and Weeds

Forage species composition and weed cover were measured the first week of May before grazing began and in late August, near the end of the grazing season. Sampling was conducted in 2016 and 2018 and only in ALF and SL treatments as we were most interested in species changes within interseeded legume pastures. The percent ground cover of forage species and weeds was estimated within 8 randomly-located 0.25 m² quadrats using a modified Daubenmire method [40,42]. Sampling was stratified such that four quadrats were evaluated within each fescue and legume sward, respectively. Percent cover of sown species (alfalfa, sericea, and tall fescue) was estimated as was cover from several common forage species that were not sown (white clover, orchardgrass and Kentucky bluegrass (Poa pratensis)). Weed species was a single category and defined as any species not sown or part of the three common forage species mentioned above.

2.2. Data Analysis

Statistical analyses were performed on herbage mass and animal performance/weight gain to test for differences among the three forage treatments—ALF, SL, and TF. Forage mass data had subsamples and repeated measures (i.e., months and years). To manage non-independence, treatment replicates (plots) were nested into the main effect (forage treatment) using the following model:

\[ Y_{ijk} = \mu + A_i + B_{j(i)} + C_k + AC_{ik} + CB_{kj(i)} \]

where \( i = 1 \) to \( a \) treatments, \( j = 1 \) to \( b \) replicates (or plots) and \( c = 1 \) to \( k \) times. In a repeated-measures design, replicate is equivalent to entire plot. In this case, the replicate, or the plot (\( B_j \)) was nested into the main effect of treatment (\( A_i \)). The within-plot factor (\( C \)) was time, with each sampling period applied to a different treatment level. By using the same method, the paddocks or plots were nested into different forage treatments in this analysis. For the animal measurements, there were two animals per plot and these were treated as subsamples. Because animals were different every year, we considered weight gain (ADG) independent over the years. The problem of subsampling was solved by taking the mean two animals in each plot. Residual distributions of the herbage and cattle data were checked for normality and required no transformation. To test for treatment differences in forage cover and weeds in the interseeded legume treatments, one-way ANOVAs were conducted on data from the 2018 season. Cover was checked for non-normality and log
transformed before analysis. Untransformed data were presented. Statistical analysis was performed using the JMP statistical package [43] and significance was considered \( p < 0.05 \).

3. Results

3.1. Animal Performance

Average daily gain (ADG) over the first part of each grazing season (May to July) did not differ among the treatments (\( p = 0.25 \)) nor was there a treatment x year interaction (\( p= 0.57 \)). However, a treatment x year interaction (\( p < 0.001 \)) in season-long ADG was observed over the course of this study (Table 1), likely due to lower gains on TF in 2016. Overall, ADG averaged 0.73 kg d\(^{-1}\) across all treatments over the three years of this study.

Table 1. Mean steer ADG (kg d\(^{-1}\)) over each grazing season (May to September). \( p \)-values represent treatment differences for each respective year. ALF = tall fescue interseeded with alfalfa, SL—tall fescue interseeded with lespedeza, and TF—tall fescue control.

| Year | Treatment | ALF | SL | TF | \( p \)-Value |
|------|-----------|-----|----|----|-------------|
| 2016 | 0.86      | 0.83| 0.59|    | <0.0001     |
| 2017 | 0.69      | 0.76| 0.67|    | 0.29        |
| 2018 | 0.74      | 0.72| 0.71|    | 0.73        |

3.2. Herbage Mass

Herbage mass data showed strong treatment x month and treatment x year interactions (Table 2). Herbage mass in the ALF and TF treatments tended to decline each month, while it increased in the SL plots through the summer (Figure 1). In 2016, herbage mass in the SL treatment was lower than in other years and did not exceed TF and ALF treatments until August.

Table 2. ANOVA results from analysis of herbage mass data. * Refers to treatment interaction.

| Source                   | Df  | Sum of Squares | F-Ratio | Prob > F |
|--------------------------|-----|----------------|---------|----------|
| Forage Treatment         | 2   | 154,373,629    | 95.1946 | <0.0001  |
| Forage Treatment * Year  | 4   | 33,234,807     | 10.2471 | <0.0001  |
| Forage Treatment * Month | 8   | 58,157,036     | 8.9656  | <0.0001  |
| Plot [Treatment]         | 19  | 68,734,183     | 4.4616  | <0.0001  |
| Year                     | 2   | 11,147,240     | 6.8740  | 0.0012   |
| Month                    | 4   | 126,432,562    | 38.9824 | <0.0001  |

3.3. Forage Species Composition and Weeds

Sericea establishment was successful and cover increased both within seasons and from season to season (2016 vs. 2018; Table 3). Sericea cover was limited in May (11% in 2016 and 13% in 2018) but increased markedly by August (53% in 2016 and 82% in 2018). In contrast, alfalfa declined within seasons and from season to season. Alfalfa cover in May was 57% in 2016 and 21% in 2018 but by August had decreased to 3% in 2016 and 1% in 2018. Many white clover seedlings emerged from the soil seedbank in the SL and ALF treatments in 2016, contributing 29% and 24% of the cover in those treatments, respectively. White clover cover declined substantially by 2018 as did cover of tall fescue but less so (Table 3). We did note that tall fescue was encroaching back into ALF strips by the end of this study. Kentucky bluegrass cover increased (\( p < 0.05 \)) from 2016 to 2018. Weed cover tended to be lowest in tall fescue swards and data give little indication that weeds were suppressed in SL treatments in 2016 (Table 3). However, in August 2018, weed cover was lower (\( p < 0.05 \)) in the SL treatment (1%) compared with ALF (26%).
Figure 1. Mean monthly herbage mass (kg ha\(^{-1}\)) over each grazing season, 2016–2018. ALF—tall fescue with alfalfa monoculture, SL—tall fescue with sericea monoculture, and TF—tall fescue control. Herbage mass samples were not collected in September 2018.
Table 3. Percent ground cover of major forage species and weeds in the legume-interseeded treatments (ALF and SL). Measurements were taken before grazing started in May and when animals were removed in August (2016 and 2018). Sampling was stratified in treatment plots—mean cover values in first row represent interseeded legume strips, and values in second row represent tall fescue swards. Bare ground and senescent vegetation cover values are not shown, so totals may not equal 100%.

| Year | Treatment | Tall Fescue | Alfalfa | Sericea | W. Clover | K. Bluegrass | Orchardgrass | Weeds |
|------|-----------|-------------|---------|---------|-----------|--------------|--------------|-------|
| 2016 | ALF       | 3           | 57      | 0       | 29        | 0            | 0            | 9     |
|      | SL        | 76          | 0       | 0       | 6         | 2            | 2            | 3     |
| 2018 | ALF       | 13          | 3       | 0       | 5         | 23           | 1            | 26    |
|      | SL        | 52          | 0       | 0       | 2         | 13           | 6            | 2     |

| Year | Treatment | Tall Fescue | Alfalfa | Sericea | W. Clover | K. Bluegrass | Orchardgrass | Weeds |
|------|-----------|-------------|---------|---------|-----------|--------------|--------------|-------|
| 2016 | ALF       | 7           | 21      | 0       | 27        | 3            | 0            | 16    |
|      | SL        | 55          | 0       | 0       | 10        | 5            | 1            | 6     |
| 2018 | ALF       | 17          | 1       | 0       | 2         | 31           | 1            | 26    |
|      | SL        | 54          | 0       | 0       | 1         | 19           | 1            | 7     |

4. Discussion

4.1. Animal Performance

Neither system with legumes supported greater ADG when averaged over 3 years. We used steer ADG as a proxy for forage quality in this study and hypothesized that the presence of alfalfa or sericea (and associated condensed tannins) would improve cattle performance compared with the TF monoculture. The substantial decline in alfalfa biomass within seasons and from season to season suggests its greater preference to steers, its lack of tolerance to continuous stocking, or both. Regardless, the lack of available legume biomass under this management likely limited opportunity for improved gain with the alfalfa treatment.

In contrast, sericea cover and biomass increased over each grazing season. Rather than a legume biomass limitation, animal performance on the SL treatment was likely limited by the high tannin concentration in AU Grazer. Elevated condensed tannins can limit intake [38] and sheep fed sericea pellets with condensed tannins concentrations similar to that in our study had lower nitrogen, fiber, and dry matter digestibility [44]. Although presence of condensed tannins in the diet of ruminants has been hypothesized to help bind fescue toxins and reduce their absorption into the blood stream [32], unfortunately, this hypothesis could not be evaluated given the low endophyte infection level in the KY31 tall fescue swards.

Initially, ADG was higher in the ALF and SL treatments and this likely reflected availability of palatable legumes. White clover, in particular, was abundant in both ALF and SL treatments in 2016. Many studies have reported improved animal performance when legumes were interseeded into tall fescue swards [45-48], including significant improvements in nutritive value [49,50]. With respect to white clover, Lomas et al. [51] evaluated steers grazing tall fescue pastures interseeded with ladino white clover (Trifolium repens L.), red clover (Trifolium pratense L.) or annual lespedeza (Lespedeza striata) and...
found that fescue pastures with ladino clover produced 28–36% greater gains over other pasture treatments.

The similar ADG across treatments later in our study likely reflects the fact that steers were grazing mostly tall fescue having little alfalfa or white clover in the ALF treatment late in the season. In contrast, while steers on the SL treatment pastures had ample sericea to graze, they ate little of it (see discussion below). Given lack of high-quality legumes available late in each season, it was not surprising that ADG values were similar across treatments. Overall, steer weight gain across years was comparable to averages of ADG on low-endophyte fescue reported in other Virginia studies [52], and this probably reflected adequate summer moisture to support forage growth and low endophyte infection in tall fescue plants.

4.2. Herbage Mass and Grazing Observations

The trends in the herbage mass data have two major implications. First, they show that sericea could be a valuable summer forage and may help fill in the so-called ‘summer slump’ in forage growth that is common in pastures in the upper south. The summer slump occurs when cool-season C-3 forages slow growth in response to higher temperatures and lower rainfall [53]. Despite being a C-3 legume, sericea exhibited growth patterns similar to warm-season C-4 grasses, which tend to be most productive in mid-late summer [54]. Second, the herbage mass data suggest that sericea was largely unpalatable to cattle, and this probably contributed to the different seasonal patterns observed in the SL treatments compared with the others.

Although herbage use by cattle was not quantified, consideration of tannin effects on animal grazing behavior warrants discussion. Repeated observations gave indication that cattle did not prefer sericea and consumed little of the herbage during this study. Steers, if they grazed sericea at all, usually nipped off the new growth from the top of select sericea plants and rarely grazed plants in their entirety. Similar findings were reported in a grazing study using yearling steers in city, MA, USA [55]. The authors reported that older animals (2–3-year-old steers) appeared to graze sericea more readily. In our case, however, steers were yearlings and naïve to sericea. The grazing patterns observed with steers on the sericea treatment are in contrast to steer behavior on alfalfa strips which were selectively grazed.

Steers likely avoided sericea plants because of their high condensed tannin and fiber concentrations. Although fiber concentrations were not monitored in our study, mature sericea plants such as those in our study are like small woody shrubs and well known to have highly lignified tissues [56]. Total condensed tannin concentrations in sericea tissue collected from randomly selected plants averaged 16.9% (SD = 2.8) and 17.7% (SD = 1.0) in August 2017 and 2018, respectively. From a plant perspective, these concentrations were not exceptionally high for common sericea varieties and within ranges reported in other studies that evaluated condensed tannins in sericea [57–60]. However, these concentrations were high—and undesirable—from an animal intake perspective [38,44,61]. Steers likely avoided sericea because they had more palatable forage available to them in adjacent low-endophyte tall fescue swards. Cattle will graze sericea, particularly when it is the only forage offered in a pasture situation, and tannins have been shown to exhibit favorable post-ingestive feedback effects on high-alkaloid tall fescue [62]. However, more work is needed to understand how tannin-containing forages can be used effectively, both in feedlot [58] and pasture situations, as other factors such as animal age, prior animal exposure to the forage, and processing sequence of presentation [36] likely affect livestock behavioral, metabolic and performance responses.

4.3. Forage Species Composition and Weeds

The composition of major forage species and weeds changed substantially over this study. Not surprisingly, sericea cover increased over the course of this study as it tends to form dense monoculture stands over time [58]. This trend likely reflected grazing avoidance
by cattle and also a natural tendency for sericea stands to thicken over time, possibly from recruitment from the soil seedbank. Although Ameristand 403 alfalfa is considered grazing tolerant [63], it clearly was not well suited to the continuous grazing used in this study and was virtually grazed out by 2018.

Tall fescue cover tended to decline in the pastures with contiguous legume monoculture treatments and this might reflect the low endophyte content in the fescue plants. Fescue plants that are endophyte free usually have a diminished level of stress/grazing tolerance compared with endophyte-infected fescue [3,53]. Grazing pressure on tall fescue in the two legume treatments was probably high later in this study as steers avoided sericea and had selected out alfalfa. Under these continuously grazed conditions, it appears that the lack of fescue persistence was compensated by an increase in Kentucky bluegrass, which is better adapted to close grazing.

Lastly, we hypothesized that sericea might have allelopathic effects on adjacent plants as has been reported in other studies [39,64]. If this were the case, we might have expected lower weed abundance in the SL treatment plots. As Table 3 shows, there was little indication that weeds were suppressed in the SL stands until late 2018, when sericea cover was very high and may have competitively excluded weeds. Allelopathy can be difficult to prove—especially in the field. While some studies have shown that sericea might have allelopathic tendencies, those effects may not be persistent or readily observable under field conditions [65]. Moreover, the low grazing/selection pressure placed on sericea may have increased grazing pressure on weed populations.

5. Conclusions

The primary aim of this study was to evaluate whether summer-productive legumes such as sericea or alfalfa could improve animal performance when added within tall fescue pastures. The poor persistence of alfalfa over time and the poor apparent palatability of sericea limited intake of both legumes, and neither legume system conveyed an animal performance benefit relative to a low-endophyte fescue monoculture. For alfalfa to have benefit, greater grazing management or continued improvement in grazing tolerance is needed. As sericea grows well in hot, dry conditions, our data suggest that it could help mitigate the summer slump in forage productivity common to cool-season pastures in the southeast of the USA. A lower-tannin sericea variety might have been preferable as palatability issues limited sericea intake in this study.
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