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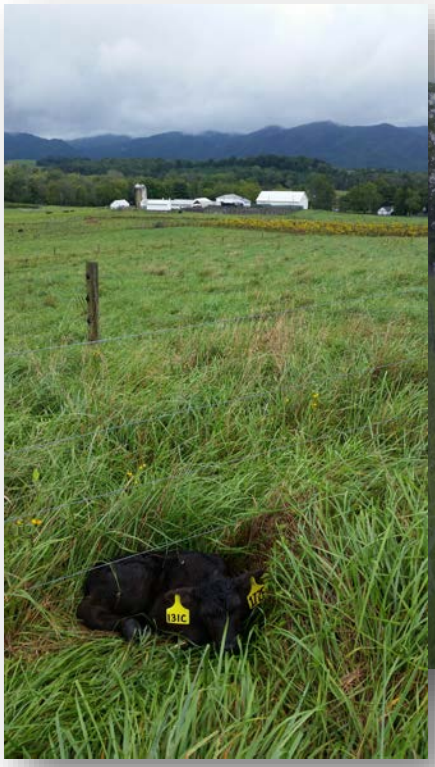

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Effect of Different Backgrounding Diets on Performance of Beef Calves during Transportation and in the Feedyard

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Management during the period of time immediately post weaning is very important to the future of calves as they transition into a feedyard. This is commonly accomplished in the southeast using many diets. The objective of this study was to evaluate if backgrounding diet has an effect on performance of calves shipped to feedyards in western Kansas from Alabama. 120 fall-born steers (n=60, 524.5±47.1 lbs. BW) and heifers (n=60, 501.8±39.4 lbs. BW) at the E.V. Smith Reseach Center in Shorter, AL were weaned on June 14, 2018 and held in drylots for 14 d until forages reached an adequate height to begin grazing. Calves were randomly assigned to one of four diets: grazing (G), grazing with supplement (GS), dry hay with supplement (HS), or baleage with supplement (BS). Prior to starting and after 68 d on treatment diets, calves were subjected to carcass ultrasound to evaluate differences in Ribeye Area (REA), Intramuscular Fat (IMF), and Backfat Thickness (BF). After 80 d, calves were shipped to a feedyard in Kansas. Immediately prior to shipment, immediately post-shipment, and after 24 h rest the calves were weighed and shrink percentages calculated. Weights were also collected after 7 d, 28 d, 55 d, and 105 d on feed. No differences were found between GS, HS, or BS calves at any weigh period or for any of the carcass ultrasound measurements ($P>0.05$). G calves had significantly greater shrink immediately post transportation ($P<0.05$), but were not different after 24 h rest ($P>0.05$). While there were no differences in REA or IMF, G calves had less BF than other diets ($P<0.05$) after 68 d on diet treatments. For all weigh periods prior to 55 d on feed, G calves were significantly lighter than other treatments ($P>0.05$). At the 55 d and 105 d, G calves were not significantly different than other treatments ($P>0.05$).

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Improvement of a Native Cool-Season Grass, Southeastern Wildrye (Elymus glabriflorus)

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Work with North American native grasses has almost exclusively focused on warm-season C4 grasses. There is a need for the inclusion of native cool-season grasses for reclamation of grasslands. Originally lumped in with Canada and Virginia wildrye (*Elymus canadensis and E. virginicus*, respectively), southeastern wildrye (*E. glabriflorus*) was recognized as a separate species in 2007. The occurrence of southeastern wildrye in the Deep South is favored over Canada wildrye, and in full sun locations, southeastern wildrye predominates over Virginia wildrye. Being relatively new to agronomists, cultural parameters and establishment experiments were conducted to aid in research and breeding programs. Optimal germination requirements were examined. Data suggests optimal temperature for germination is between 15-20°C. Photoperiod did not affect germination. Germination is greatest at pH greater than 5.0, though germination does occur at lower pH. Seed conditioning (removal of the beard) decreases germination, but also negatively impacts shelf life of the unplanted seed. Maximum seedling emergence occurs at a planting depth of 0.64 cm. While most references indicate natives do not need high levels of fertility, southeastern wildrye is highly responsive to nitrogen application. Like most natives, persistence declines with greater than two cuts per season. Tolerance of southeastern wildrye to herbicide application at the five-leaf stage. Herbicides included imazethapyr, sulfometuron methyl, quinclorac, mesotrione, sulfentrazone, imazapic, nicosulfuron, thifensulfuron methyl, and sulfosulfuron. Herbicides were applied at label rates with recommended adjuvants. Plant height, seed and biomass yield, and plant population were negatively impacted by application of sulfometuron methyl (Oust XP) only. Antidotal evidence indicates limited tolerance to the auxin-type herbicides. Southeastern wildrye is primarily self-pollinated, though about 8-12% crossing does occur and extends to related species. Selection and genetic improvement requires the accumulation of large numbers genotypes and the close quantification of specific characteristics.

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Is Dilution the Solution? Assessing Tall Fescue Toxicity in Cool-Season Pasture

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Endophyte infected tall fescue is the most important and common cool season forage for Virginia livestock producers. The fungal endophyte presents a challenge, as it produces toxic ergot alkaloids that cause a myriad of problems including reduced weight gains, reduced milk production, and reproductive performance, among other issues. Recommendations for managing tall fescue toxicosis have included diluting fescue toxins by interseeding legumes, particularly red and white clover varieties. To evaluate this practice as well as interseeding alternative forages such as bermudagrass and alfalfa a demonstration was conducted frost seeding a normal broadcast rate (1X) and a double rate (2X) of a grazing type alfalfa, bermudagrass, and red and white clover mixture. Short term and long-term establishment of these forages were limited, fescue made an average of 70% of the pasture. Forage samples were collected for tall fescue in year 2 and 3 and total forage sward ergot alkaloid concentration in year 3. All tall fescue samples collected had a total ergot alkaloid concentration above 400 parts per billion (ppb). Total sward total ergots were lower ($P<0.10$) than tall fescue alone. Both fescue total ergot alkaloids and total ergot alkaloids were reduced ($P<0.10$ and $P<0.05$) when rotationally grazed early when compared to summer stockpiled fescue respectively. Managing pastures for cool season species diversity and early spring grazing may reduce total pasture toxicity.

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Harvest Management Effects on Growth of Winter Cover Crop Mixtures and Subsequent Hay Production

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Cover crops reportedly improve soil health and production in cropping systems, but there are few reports of cover crop use in pastures. Experiments were conducted at Raymond, MS, and Homer, LA., to determine the contributions of grasses, legumes, and brassicas as cover crops, with 4-, 8-wk harvest frequency (HF), or left as a mulch. Using 11 species, cover crop (CC) treatments were mixtures of 1) all species, 2) all grasses, 3) all legumes, 4) all brassicas, 5) grass-legume, 6) grass-brassica, 7) legume-brassica, 8) monoculture annual ryegrass 9) none over-seeded with weed control, and 10) none-overseeded with no weed control. The experiment was a split-plot arrangement of a randomized complete block design with three replications. At Raymond, there was an effect of HF ($P < 0.05$) on CC forage mass. Mulch (2450 lb/acre), and 8-wk (2350 lb/acre), both were greater than 4-wk HF (1900 lb/acre). There was an interaction effect on botanical composition (BC). Generally, grass was dominant (73-83%) in mixtures with legumes harvested at 4-wk but not at 8-wk HF (55-60%) or mulch treatment (59-65%). There was an HF effect ($P < 0.001$) on subsequent annual hay production, ranking mulch (3300 lb/acre) > 8-wk (2800 lb/acre) > 4-wk (2550 lb/acre). At Homer, there were CC ($P < 0.001$) and HF ($P < 0.001$) effects on CC production. Across HF, forage mass ranked mulch (3850 lb/acre) > 8-wk (3200 lb/acre) > 4-wk (2850 lb/acre). Across CC treatments, the all-species and the grass-legume mix had greater forage mass (4500 – 4600 lb/acre) than grasses alone (2700 lb/acre), grass-brassica (3400 lb/acre) or monoculture annual ryegrass (2500 lb/acre). There was an interaction effect ($P < 0.001$) on BC at Homer also. In mixtures with grasses, the percent grass was greater in the mulch treatment than harvested plots, and percent legumes in mixtures were greater in 8-wk and mulch than 4-wk HF. Hay production was greater at 4-wk than 8-wk or mulch, and greater in treatments that included legumes. These first-year results indicate that winter CC and HF can have an effect on hay production, and legumes in the mix can be beneficial.

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Impact of Planting Rate on Pasture Productivity when Frost-Seeding Clovers into Existing Tall Fescue Pastures

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Frost-seeding clovers (*Trifolium* spp.*)* into grass pastures is a relatively low-cost and simple method for developing grass-legume mixtures in the transition USA region. Grass-legume pastures, such as tall fescue [*Festuca arundinacea* (Schreb.)] -clover mixtures, can help alleviate fescue toxicosis issues, result in pastures of greater productivity and nutritive value while limiting the need for external sources of N-fertilization, and ultimately result in greater animal responses. In light of new seed-coatings that can make up a considerable proportion of the seed weight that is purchased by producers, research was conducted to better understand seeding rates and its impact on pasture productivity when frost-seeding clovers into existing tall fescue pastures. The overall objectives of this research were to evaluate establishment, botanical composition, nutritive value, and herbage mass of four clovers [red (*Trifolium pratense*), white (*Trifolium repens*), crimson (*Trifolium incarnatum*), and ball (*Trifolium nigrescens*)] frost-seeded at four seeding rates (x-amount as the commercially labeled recommended seeding rate, 0.5x, 1.5x, and 2x) into well-established tall fescue pastures. Clovers were frost-seeded by hand-broadcasting the seed in early- to mid-February in 2017 and 2018. Experimental unit size was 15 m^2 plots (5 by 3 m) and plots were arranged in a randomized complete block design replicated three times. The experiment was conducted in two locations in North Carolina, one location at the Coastal Plains and the other at the Piedmont physiographic regions. Preliminary results indicate greater pasture productivity and lower weed infestation for treatments with greater seeding rates of frost-seeded clovers; however, the impact of planting rate varied by clover type and year-location environment. The trial is being replicated for a third year and the results and implications of treatments imposed will be discussed in this presentation.

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Tree-Species Impact on Forage Productivity and Heat-Stress Mitigation in a North Carolina's Silvopasture System

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Silvopasture systems can provide multiple ecosystems services and represent a multiple-income source enterprise for land managers that benefit from the integration of trees, livestock, and forages. The objectives of this research were to: 1) characterize and compare shade, and forage productivity, and 2) to determine a mitigation (MIT) parameter, defined as the ability of the silvopasture system to reduce the air temperature and thermal-humidity index (THI), as a function of tree-species in a silvopasture setting vs. open pasture. The silvopasture system (35°22'N; 78°2'W; North Carolina, USA) was designed as an alley-cropping system with a factorial combination three tree-species (Pinus palustris, PP; Pinus taeda, PT; and Quercus pagoda, QP) and two alley-widths (12 and 24-m between lines of trees) (Fig. 1). Understory forage was a mixture of native warm-season grasses [big bluestem (*Andropogon gerardi*), gamagrass (*Tripsacum dactyloides*), indiangrass (*Sorghastrum nutants*), and switchgrass (*Pannicum virgatum*)]. Light environment under the trees was ~20% of the incident light compared to open pasture and it was not different among tree-species during summer but different during winter. Forage productivity was lower by ~30% at 3-m away from the tree-lines vs. 12-m away at one sampling location. All the tree species were able to provide a significant MIT during daylight hours with greater impact during summer months. The three different species showed a different ability in MIT; QP showed the strongest MIT, which was significantly larger compared to PP and PT, which in turn showed similar values. The MIT was also different depending on the month of the year, with stronger MIT during the months of June, July and August 2018.

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Temporary Electric Fencing Demonstration Kit Program: On-Farm Management, Education, and Barriers for Use

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Temporary electric fencing technology may complement existing permanent fencing infrastructure in pasture-based management systems and improve flexibility in grazing management in on-farm settings. In 2018, Alabama Extension partnered with USDA NRCS Alabama to purchase a set of starter grazing kits for use in on-farm forage management demonstrations. Grazing kits included 25 tread-in posts, a roll of polywire, a geared reel, solar fence charger, grounding rod, and fault finder. Five grazing kits were distributed around various regions of the state among producers in fall 2018. Producers were trained by Alabama Extension Animal Science and Forage Agents and USDA NRCS personnel on how to set up the kit and provided suggested recommendations for use during the cool-season grazing season. Three of the five kits were used during the winter management season. The remaining kits were not used due to change in farm management/sale of the proposed property for use, or failure to establish cool-season annuals. Farmers who successfully used the kit (n = 3) were asked to participate in a follow-up survey on perceptions and ways the kit was used during the winter. Farmers reported their average herd size was 36 cow-calf pairs. Producers reported that the temporary fencing kit helped extend the length of the cool-season grazing season, and improved forage use efficiency. The average number of grazing days achieved for the pasture area in which the kit was utilized was 55 days on 26 acres using a frontal grazing approach. Producers primarily grazed stockpiled tall fescue or cool-season annuals (annual ryegrass, or annual ryegrass and crimson clover). 100% of farmer participants indicated that they had shared information about the grazing kit with other farmers or friends, which reached an average of 20 people per farm. Two of the three farmers who used the kit in the winter purchased the kits for their replacement value ($550), and indicated that they plan to continue to use the equipment as part of their forage management plan. These data illustrate that these kits provided an effective tool for peer-to-peer sharing of experiences with temporary electric fencing, and were useful for making improvements in their beef operations.

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Vision, Teamwork, and Programmatic Efforts Support Silvopasture Adoption in Virginia

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Surveys of Virginia landowners indicate silvopastures are of interest to producers across production scales. Silvopasture adoption in the mid-Atlantic has been constrained by lack of awareness and understanding by farmers and technical service providers alike. Limited research and outreach efforts by educators and extension personnel and a dearth of "on-the-ground" models of successful silvopasture systems are important constraints to awareness. Adoption is further challenged by skepticism and mistrust. Many farmers have a generational history of clearing trees to create pasture and crop land, and technical service providers (TSPs) have been trained (and programs established) to keep livestock and forests separate. Changing such culture takes time, effort, and teamwork. Development of a team has been essential and integral to our success. Colleagues from diverse academic and technical service backgrounds initiated efforts with state-level SARE funds for "Professional Development Programming" that included field days and training by local and national experts. Currently, Virginia Tech has four research or demonstration sites across diverse regions of the state and a fifth is being implemented. In addition, our team has developed collaborations with several producers to showcase silvopasture efforts by private landowners. Collaboration with the Natural Resources Conservation Service to promote these systems also has been essential, and silvopasture is now a fundable conservation practice in Virginia's environmental conservation programs. Application of silvopasture and other practices are now part of a Bay-area grant received by the Virginia Department of Forestry and promotional efforts by the Chesapeake Bay Foundation are also spreading the word about this practice. Educational programming developed for a high school (that has capacity to create silvopastures) has also resulted in several parents seeking more information about how to apply these practices to their farms. Silvopastures are complex systems requiring require intensive management and will not be adaptable by all producers. Entrenched sentiments about what is appropriate land management may also prevent some TSPs from recommending silvopasture management. However, initial results indicate high levels of acceptance with training and demonstration.

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Effectiveness of Imazapic (Plateau) Herbicide in the Establishment of Native Warm-Season Grass and Wildflower Stands

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Interest in integrating native warm-season grasses (NWSG) and wildflowers into agricultural systems is growing, but little research into the efficacy of different methods of establishment in Virginia has been conducted. In this field experiment, we compared two methods of establishment of NWSG and wildflowers for pasture: a glyphosate-only treatment, and a glyphosate and imazapic treatment. Six 1.8 acre plots were established in the Shenandoah Valley of Virginia in the summer of 2017, planted with one of two seeding mixes: a NWSG-only mix of big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), and indiangrass (*Sorghastrum nutans*), or a combined NWSG and wildflower mix of the above three grasses and an additional 15 wildflower species. Both treatments received glyphosate at a rate of 1 qt/acre prior to establishment to kill extant vegetation in preparation for seeding. The herbicide treatment received imazapic at a rate of 2oz/acre at seeding. Species density and cover data as well as dry matter yield of NWSG, wildflowers, and weeds were collected in fall 2017 and spring 2018. Weed cover, density, and yield were higher in glyphosate-only plots compared with imazapic treated areas. Similarly, wildflower cover, density, and yield were higher in plots that received only glyphosate. However, there were no differences in NWSG cover, density, or yield between treatments.

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Comparison of N Compound Partition in Legume Forage

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Legume forage crops generally have higher feed value, especially crude protein (CP), than grass forage. Content of CP is useful information to estimate potential feed value of forage and feedstuff. However, CP is a calculated value based on total N content, and it is sometimes not enough to interpret utilization aspects of feed protein in ruminant digestion system. Partitioning of N compounds have been studied in feed ingredients and conventional legume forages. Data related to N compound proportion in less conventional legume forage is limited. A study was conducted to investigate the proportion of nitrogen compounds in legume species commonly found in Louisiana pasture. Legume species such as alfalfa (*Medicago sativa*), herbaceous mimosa (*Mimosa strigillosa*), Persian clover (*Trifolium resupinatum*), bur clover (*Medicago polymorpha*) and hairy vetch (*Vicia villosa*) were collected from pastures located in north central and south central Louisiana. Randomly collected samples were dried at 131^{O}F for minimum 72 hours. Content of CP, non-protein N (NPN), soluble N (SN), acid detergent insoluble N (ADIN) were partitioned. Data were analyzed by pairwise comparison by species considering location as a random effect. Content of CP in herbaceous mimosa, Persian clover, and bur clover were 18.2, 19.9, and 21.0%, respectively, which is lower than that in bud stage alfalfa by up to 10%. The ADIN in herbaceous mimosa was greatest (2.4%) among the tested legumes followed by persian clover (2.2%) and flowered hairy vetch (2.0%). The NPN in legume forage ranged from 3.2 to 4.3%. The partitioning of soluble and insoluble proteins varies in a wide range within species or within location, and needs to be validated with more sample analysis. Comparing with bud stage alfalfa, some less conventionally used legume species demonstrated unique features of N compound partitions. This may affect degradability and utilization of legume proteins in the rumen, and result in different forage N utilization by ruminant animals.

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Evaluation of *Brassica* Species in South-Central Oklahoma for Potential Cover Crop and Grazing System

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Brassica species are known for their rapid growth and nutrient scavenging ability. The objective of this study was to screen the accessions currently available from the USDA-ARS Germplasm Resources Information Network to identify accessions that are potentially superior to the commercially available cultivars which could then be utilized in a crop improvement breeding program. Autumn-planted field experiments were conducted in south-central Oklahoma during the 2017-18 and 2018-19 seasons. In this study, a total of 3745 accessions of nine *Brassica* species or types were evaluated in 2017-18 with appropriate commercial varieties as checks. Criteria used for these evaluations included visual ratings of vegetative freeze damage, spring regrowth, estimated autumn and spring biomass production, and 50% flowering dates. Accessions which were rated either comparable or superior compared to the respective species' check cultivars were, or will be, allowed to mature and then harvested for seedstock. Based on results from 2017-18, 81 total accessions were successfully advanced in 2018-19 and consisted of 11, 10, 26, 25, and 9 accessions from *Brassica rapa* L., *B. nigra* (L.) W.D.J. Koch, *B. juncea* (L.) Czern., *B. napus* L., and *Raphanus sativus* L., respectively. Accessions of *Cichorium intybus* L. had poor germination, and the *B. oleracea* L. evaluation was lost to adverse environmental conditions, therefore both have been replanted for evaluation in 2018-19. Preliminary results for the 2018-19 *B. oleracea* trial indicate 12 possible lines for advancement (out of 893 total accessions). Evaluation of the replanted accessions of *Cichorium intybus* are incomplete but ongoing at this time. Accessions of *B. carinata* A. Braun, and *Sinapis alba* L. winter-killed and did not survive, therefore these species will not be evaluated further. The accessions selected for advancement will be evaluated in future replicated trials at additional sites to determine all potential crop improvement criteria.

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Bermudagrass Stocker Grazing Systems in the Southern Great Plains

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Bermudagrass [*Cynodon dactylon* (L.) Pers.] is the most common warm-season perennial forage in the southern Great Plains, however its low nutritive value limits its use for stocker cattle. Interseeding alfalfa (*Medicago sativa* L.) into established bermudagrass pastures may increase intake and nutritive value, reduce N requirement, and increase seasonal forage distribution. The objectives of this study were to determine the effects of: (1) five forage system treatments (bermudagrass + '800RR' alfalfa, and bermudagrass with 100 lb N acre^{-1}, 100 lb N acre^{-1} + feed supplement, 0 lb N acre^{-1}, and 0 lb N acre^{-1} + supplement) and (2) two stocking methods [continuous (2 acre) and rotational (four 1 acre paddocks rotated every 7 d)] on alfalfa stand and Angus x Brangus heifer (668 ± 51 lb average initial weight) production and performance in Ardmore, OK, from 2016 to 2018. Alfalfa stands were similar ($P > 0.05$) between continuous and rotational treatments at grazing initiation on 19 May 2016, however at the end of the first year and continuing through 2018, rotational had greater stands than continuous ($P < 0.05$). Average daily gain (ADG) of all forage system treatments decreased as the grazing season progressed, and ADG of all forage systems except bermudagrass with 100lb N acre^{-1} + supplement fell below 1.0 lb day^{-1} in mid-July. Only bermudagrass + alfalfa showed an increase in ADG in autumn to greater than 1.0 lb day^{-1} as biomass of alfalfa increased. Bermudagrass + alfalfa had the most total grazing days (177 vs average 134 days; $P < 0.001$). Bermudagrass + alfalfa and bermudagrass with 100lb N acre^{-1} + supplement resulted in greatest ADG and total animal gain acre^{-1} ($P < 0.001$). Alfalfa interseeded into bermudagrass may extend the grazing season and improve nutritive value and animal performance. However, it may not be advantageous to graze stocker cattle on bermudagrass after mid-July, when ADG < 1.0 lb day^{-1}. This study will continue through 2019, and economic analyses will be conducted to determine if any of these forage systems are economically viable for grazing stocker heifers.

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Effects of Fescue Cultivar on Performance of Beef Cow/calf Pairs Grazed on Summer Stockpiled Tall Fescue Pastures

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The objectives of this 2-year experiment were to evaluate forage characteristics of wild-type endophyte-infected tall fescue (**KY-31**) and novel endophyte-infected tall fescue (**MaxQ**) within summer stockpiled (**SS**) pastures and to measure the performance of fall-calving beef cow/calf pairs grazed on each cultivar. Pregnant Simmental x Angus cows (128 total, 64 each year) were stratified by BW, BCS, and expected calving date and then allotted to 1 of 10 groups that were grazed on either cultivar. Forage growth accumulated from April to initiation of strip-grazing on August 31 of 2017 and 2018. Cows were grazed on treatment pastures for 52 d from 23 ± 14 d prepartum to 29 ± 14 d postpartum. Cows calved on treatment pastures. Forage quadrats were clipped from the grazed and ungrazed portions of each pasture to determine weekly forage mass (**FM**). Total ergot alkaloid (**TEA**) concentrations were analyzed for all pastures at the beginning of the experiment and every subsequent 2 weeks for KY-31. Cow BW was recorded on 2 consecutive d and BCS determined at the start and end of the experiment. In year 2, ultrasound 12th rib fat thickness was measured at the beginning and end of the treatment period. Calf BW was recorded within 24 h of birth and on 29 ± 14 d of age. Milk production was estimated using the weigh-suckle-weigh technique at 29 ± 12 4 postpartum. In year 1, initial TEA concentrations were decreased (P<0.001; MaxQ=112 µg/kg, KY-31=1774 µg/kg) for MaxQ relative to KY-31 and did not differ (P<0.48) in KY-31 over time. No treatment differences (P≥0.15) in forage CP, TDN, and grazed or ungrazed FM between fescue strains were observed. Cow BW, BCS, and ultrasound 12th rib fat thickness at the beginning and end of grazing were not different (P≥0.41) by fescue cultivar. Calving date, calf BW, calf ADG were not different (P≥0.65) by treatment. Milk production was higher (P<0.01) for KY-31 grazed cows. Neither AI nor overall conception rates were different (P≥0.23) between cultivars. Grazing MaxQ rather than KY-31 SS pastures resulted in no improvements in cow/calf performance under the conditions of our experiment.

Key words: beef cattle, cow/calf, fescue toxicosis, novel endophyte-infected fescue, summer stockpiled fescue

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Cross-resistance of 'Tusca' Lowland Switchgrass to ALS-Inhibiting Herbicides

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Switchgrass (*Panicum virgatum* L.) is a perennial warm-season native grass that is a cornerstone species in conservation systems and can also be utilized as a high-quality forage. 'Tusca' is a cultivar of lowland switchgrass selected from 'Alamo' (USDA NRCS, Knox City, TX) for tolerance to the herbicide imazapic. This study was conducted to determine if selection breeding conferred cross-protection to similar ALS-inhibiting herbicides in Tusca. Five ALS-inhibiting herbicides, including imazapic (IPIC), imazamox (IMOX), imazapyr (IPYR), imazethapyr (ITHR), and metsulfuron methyl (MSUL), were tested on both switchgrass cultivars and wild-type johnsongrass [*Sorghum halepense* (L) Pers.] at five rates (25, 50, 75, 100, and 125% of the label rate) plus an untreated control, under laboratory and greenhouse conditions. Johnsongrass was used as a reference species to confirm efficacy of herbicide treatments. Six replications of 25 seed of both cultivars and johnsongrass were screened for response to herbicide treatment at germination as well as the 3-leaf stage. Mean germination percentage for untreated Tusca, Alamo, and johnsongrass were 71.5, 24.8, and 40.8, respectively. Compared to controls, mean germination percentage of Tusca remained >50% at all rates of ITHR and IMOX, whereas ITHR decreased germination of Alamo to <25% and IMOX to <50%. While Tusca shows some improved tolerance to IPIC at germination, greater tolerance was found to ITHR, IPYR, and IMOX, whereas mean germination percentage of Alamo was significantly reduced by all treatments.

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Effect of Supplementing Different Proportions of Lablab purpureus with Alfalfa Silage on Intake and Digestibility in Gestating Sheep

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The manipulations of diet by including forages containing moderate to high concentrations of polyphenolic compounds can change nutrient-use efficiency by ruminants. This study was conducted to investigate effects of adding different proportions of *Lablab purpureus* hay (LP) to alfalfa silage on the subsequent voluntary intake and digestibility by gestating sheep. Alfalfa was harvested in October 2018 at 75% bloom, chopped, and then packed at 55% moisture into plastic-lined bins, where it was allowed to ensile for 3 months. Alfalfa silage was either offered alone (Control; **C**, or mixed with 9 (low; **L**), 18 (Medium; **M**), or 27% high **(H**) LP on a DM basis. These diets were assigned randomly and offered for ad-libitum consumption by 16 ewes (108.2 ± 10.17 lbs. BW) in a randomized complete block design experiment with 2 periods to provide 4 observations per treatment per experimental period. Each period consisted of a 14-d dietary adaptation period followed by 7 d of total fecal and urine collection. Data were analyzed using PROC MIXED of SAS and tested orthogonally for linear and quadratic trends. Dry matter intake (% BW) increased quadratically (P = 0.04; 2.9, 3.1, 2.9, and 2.6 % for C, L, M, H, respectively) and organic matter intake (% BW) increased quadratically (P = 0.03; 2.6, 2.8, 2.7, and 2.3 % for C, L, M, H, respectively) by adding more LP in the diet. Digestible DMI (% BW) tended to increase quadratically (P = 0.08; 1.7, 1.9, 1.8, and 1.5% for C, L, M, H, respectively) by increasing proportion of LP in diet. Digestible OMI (% BW) tended to increase linearly and quadratically ($P \leq 0.10$; 1.7, 1.8, 1.7, and 1.4 % for C, L, M, H, respectively) with increasing amounts of lablab in the diet. Digestibility of DM and OM were not affected by adding LP to the diet. In this study, supplementation with 9 % LP as a source of phenolic-compounds improved forage DM and OM intake but did not affect DM and OM digestibilities. Therefore, adding a forage with moderate concentrations of polyphenols can improve forage utilization by ruminants.
The study was supported in part by USDA-ARS specific cooperative agreement 58-3655-4-052 and by USDA NIFA grant 2018-67019-27804.

Key words: Alfalfa, *Lablab purpureus*, Sheep

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Enhanced Efficiency Nitrogen Formulation Effect on Tall Fescue – Red Clover Mixed Species Pasture Productivity

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The use of nitrogen (N) fertilizer is generally limited on mixed cool-season forage systems due to its stimulatory effect on grasses, which increases competition with legume species. Reduced legume growth from this competition can compromise forage nutritive value and prospective yields. The controlled-release nature of several enhanced efficiency fertilizer N products holds the potential to improve legume persistence in mixed species pastures while providing supplemental N required by the grass component. This study evaluated the effect of different enhanced efficiency N formulations [Environmentally Smart Nitrogen (ESN), Agrotain®-treated urea (ATU), and a 75% ESN: 25% urea blend] and untreated urea on yield, nutritive value, and legume persistence in a 'KY 31' tall fescue [*Schedonorus arundinaceus* (Schreb.)] and 'Kenland' red clover (*Trifolium pratense* L.) mixture. Nitrogen was applied at four rates (0, 100, 200, and 400 lb N/ acre) in three equally split applications. This study took place at the University of Kentucky Spindletop Research Farm in Lexington, Kentucky over two growing seasons (2015 and 2016). During the first year, total seasonal yield increased with increasing N rates, but during the second growing season there was no difference in forage yield due to N rate or N source. Red clover content averaged 40 and 68% at the beginning and end of the 2015 growing season, respectively. Throughout the 2016 growing season, red clover averaged 79% of the plot sward. Although clover content averaged 50% or more throughout the study, red clover in the sward declined with increasing N rate. Environmentally Smart Nitrogen and the ESN+urea blend maintained more red clover in the plots than ATU and urea. Forage nutritive value was not affected by N rate or N source. These results suggest that no N fertilization, regardless of N source, is required when red clover comprises more than 50% of the sward due to lack of yield or quality benefit.

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Demonstrating Conversion of Wildtype to Novel Endophyte Fescue Pastures for Greater Livestock Performance and Better Environmental Outcomes

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Tall fescue (*Schedonorus arundinaceus*), the predominant forage species for animal production systems across the upper Southeast, hosts a fungus (*Epichloë coenophialum*) that produces alkaloids toxic to livestock. The toxins negatively affect animal productivity and increase heat stress, leading animals cool themselves in surface waters. New technologies offer promise for addressing this situation. Endophytes that do not create toxins can be used to create novel, non-toxic fescues. Converting to non-toxic fescue pastures both increases animal performance and improves environmental outcomes. However, producer adoption of this promising production and conservation practice has been limited by misperceptions about need and by concerns about costs versus returns. We are using a public-private partnership to develop on-farm demonstrations that increase producer awareness of fescue toxicosis, its effects on animal performance, and links to environmental quality. Tiller samples collected from demonstration farms and satellite farms indicated that the average farm infection rate was 85% for wildtype fescue pastures, and alkaloid concentrations are generally several-fold greater than the putative 400 ppb threshold for toxicosis in cattle. Five farms have worked to convert pastures to novel endophyte technologies. Field days and workshops (in conjunction with the Alliance for Grassland Renewal) have discussed the effects of toxins and need for conversion, described the conversion process (including pitfalls and opportunities to use summer annuals, and demonstrated the changes in animal behavior and performance that are possible by using novel fescue.

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Alliance for Grassland Renewal. A Collaborative Program to Improve the Understanding and Management of Fescue Toxicosis

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The Alliance for Grassland Renewal (the Alliance) is a collaborative multi-state effort to improve the understanding of fescue toxicosis and to enhance the adoption of Novel Endophyte Tall Fescue (NETF). Founded by University of Missouri Extension, the Alliance includes academic institutions, companies marketing NETF, allied companies, governmental agencies, and non-profits. Activities of the Alliance are carried out by standing committees including; 1) regulation/quality control, 2) education, 3) promotion and 4) incentives. The Alliance has organized one-day workshops, primarily in MO, since 2012. In 2017, the Alliance expanded with workshops in MO, KY, OK, and KS, and the University of Kentucky joined the board. In the spring of 2018 Clemson and NCSU joined the board, with workshops in MO, KY, SC, NC and VA. In 2019 Virginia Tech and the University of Georgia joined and workshops were presented in VA, NC, SC, GA, MO and KY. Key presentations include; managing fescue toxicosis, establishment and first year management, second year management, and economics of conversion. Additionally the agenda includes; a microscope demonstration of the endophyte, quality control and endophyte testing, industry update, drill calibration, a producer panel, and a tour of NETF plots. In 2019 there were 217 paid attendees (total attendees by location ranged 14 to 46; 69% farmers), and 178 evaluations were submitted. Attendees owned 9,693 beef or dairy cows, 2,554 stocker cattle, 133 horses and donkeys, and 876 sheep and goats. Registration fee was $70 (increased from $60 in 2018). Twenty seven % of the audience had planted NETF in the past, while 51% intend to plant NETF in the future. Reasons given for not planting included; unclear cost/benefit (14%), limited financial resources (10%), lack of knowledge (4%), and rented or unsuitable land (5%). Twenty-two percent of the audience was not planning on planting but felt they may change their decision. The Alliance is a growing and successful partnership between academic institutions and industry. The delivery of a clear message about a complex topic appears to be a key strength of the Alliance program. This approach is a model that could be applied to adoption of other new technologies.

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Pastureland Ecology 1 School for NRCS Personnel Improves Understanding of Complex Pasture Ecosystems

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Amazing Grazing is an active educational program focused on providing hands-on learning opportunities for pasture-based livestock producers and their advisors. One regular activity of Amazing Grazing is the national NRCS Pastureland Ecology 1 class taught annually for NRCS personnel from around the country. Each summer, a class of approximately 30 students including district conservationists, grazing specialists, soil conservationists and range conservationists gather for an 8-day school. While much time is devoted to traditional classroom instruction, the format is very interactive, and all outside activities include ample opportunity for group interaction. Classroom instruction topics include; animal and forage management, soil health in pastures, ecological relationships in pasture, pasture design and layout, and forage economics. The course uses a number of hands-on learning activities highlighted by the management of small groups of beef cattle, sheep, goats, and horses throughout the school. Additional demonstrations that have been developed as part of this school including burying men's cotton underwear to demonstrate soil biological activity, a demonstration of root diversity in a complex annual forage mix, an electric fence troubleshooting activity, and dung-beetle tunneling and brood ball formation demonstration. During the 19 times the course has been taught (out of 23 years), a total of 456 Conservationists from all 50 states, Guam, Puerto Rico and the District of Columbia have been trained. Students from this program are distributed all through the NRCS organization. A challenging pre-test and post-test is administered, and scores usually increase by 20% as a result of the course (in 2018 pre-test was 19.7 out of 44 points and post-test was 29.5 out of 44). The course receives very high evaluations (in 2018; overall school, 4.72 out of 5.0; would recommend to others, 4.84 out of 5.0). Many of the hands-on demonstrations used in the school have been implemented by former students in their home states, with the practice of burying underwear to assess soil health currently being used by numerous groups globally.

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Introducing Grazeable Summer Cover Crops to Wheat Systems in Oklahoma

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Winter wheat is a valuable crop in Oklahoma which grows from fall to spring. During summer fields are kept fallow; consequently, prone to erosion, weeds and water losses. Summer cover crops might be a good fit because they are known for reducing erosion, weeds, and improving soil health in different environments. However, their benefits and effects in wheat crop systems were not investigated in Oklahoma conditions. Moreover, cover crops add extra costs and its benefits might be significant after several years. Grazing cover crops might be an option that adds immediate benefit to the system by increasing profit in the short term. However, improper grazing may diminish all cover crops benefits. In order to assess the effects of summer cover crops and their grazing potential in winter wheat crop systems, experimental fields were established late spring of 2016 in Chickasha and Perkins, OK. Three legumes, three grasses, two mixes, and fallow (check) were evaluated under three simulated grazing regimes such as severe, proper, and no grazing. Grazing severity was based on minimum stubble height recommended for each cover crop by previous publications. Cover crops were terminated and winter wheat was notill planted in all plots in early fall of 2016 and 2017. Wheat will be harvested in late spring of 2017 and 2018. Data collection will include: cover crop forage yield and quality, residual cover crop biomass and its canopy cover, early spring season wheat canopy cover, forage and grain wheat yield. The results that will be presented will have a discussion focused in the suitability of introducing grazeable summer cover crops to the existing wheat systems in Oklahoma.

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Adaptive Forage Management can Improve Production Efficiency on Southeastern Livestock Farms

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Better forage management can lead to enhanced pasture-based livestock production efficiency. A 4-year project was conducted by the Amazing Grazing Program across North Carolina to explore and demonstrate novel forage management practices that might improve production efficiency. The project was funded by the NRCS Conservation Innovation Grant Program (68-3A75-14-251) and was in collaboration with the University of Georgia. In North Carolina educational demonstrations were conducted on six private farms and three public research stations. Grid soil sampling illustrated the spatial distribution of soil nutrients and other characteristics at all locations. Three of the private farms compared the impact on soil health from using simple or complex annual forage mixes. Workshops featuring winter and summer forage management practices were conducted at each private farm and the topics including; dung beetles, using annual forages in perennial forage systems, winter grazing, hay unrolling, mineral supplementation, and frost seeding clover. Total workshop registration was 153 with 120 evaluations completed. Participants were 73% male and 27% female with 51% being under the age of 50. Total number of pasture acres grazed by participants was 9207 with 4156 acres as hay. Livestock inventories for attendees were 5289 beef cattle, 505 sheep, 359 goats and 62 horses. Evaluations indicated satisfaction with workshops (scale of 1 = not satisfied to 4 = very satisfied, mean ± SD): instructors' knowledge (3.85 ± 0.35), workshop environment/format (3.85 ± 0.37), and overall quality (3.85 ± 0.35). One hundred percent of the attendees indicated that this workshop met their expectations and they would recommend it to others. This project revealed that producers are more interested in simple practices like using temporary fence, hay unrolling and frost seeding if their peers are using these techniques. Successful workshops should include hands on activities and adequate time for open discussion.

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Alfalfa Utilization in Southern Pasture Systems to Improve Beef Production

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Demand for high quality forages has increased in the southeastern U.S. due to the desire to improve livestock productivity and grazing efficiency. Alfalfa (*Medicago sativa* L.) is an ideal species that can be inserted into traditional haying and grazing systems to enhance forage quality. Furthermore, in an era of high-priced protein and energy supplements, the higher quality of alfalfa and alfalfa-grass mixtures is of significant value to the beef (*Bos Taurus*) industry, along with other forage-based livestock producers. A grazing trial was established in Newton, MS in the fall of 2016 in order to compare three perennial grass/legume systems. Treatments included 'Common' bermudagrass with no nitrogen (0N), common bermudagrass with 100 lb N in two split applications (100N), and 'Bulldog 505' interseeded into common bermudagrass (ALF). These treatments were assigned in a randomized complete block design with three replications consisting of paddocks that were approximately 2 acres in size. Four commercial beef steers with average starting weights of 602 (2017) and 619 lb (2018) were used in each paddock in a put-and-take system. Number of days grazed, average daily gain (ADG), and gain per acre (GAIN) were calculated for each paddock. Forage dry matter yield was measured before and after each grazing interval, and nutritive value analysis was conducted on samples taken at the same intervals. Differences were observed between years. Total days grazed in 2016 were 58, 65, and 65 d for 0N, 100N, and ALF treatments, respectively. For 2017, total days grazed were 90, 124, and 91 d for the same treatments. Average daily gain in 2016 was 2.03, 2.36, and 2.50 lb/hd/d for the 0N, 100N, and ALF treatments, respectively. In 2017, ADG was 0.39, 0.87, and 1.51 for the same treatments. Total gain in 2016 was 114, 155, and 163 lb/a, while in 2017, 71, 215, and 272 lb/a were recorded for the 0N, 100N, and ALF treatments, respectively. Forage DM, nutritive analysis, and economic comparisons are pending.

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Grazing Brassicas Alone or Mixed with Annual Forages during Transition Periods

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Warm-season perennial grasses primarily bermudagrass (*Cynodon dactylon*) and bahiagrass (*Paspalum notatum*) are the backbone of forage systems in the Gulf Coast region. Annual summer legumes and grasses can complement these resources. In winter, cool-season annual grasses or legumes are available. Even though many species can fit into the different ecoregions, we deal with a few weeks in the Fall and Spring when quantity and/or quality of forage are not enough to support normal animal production targets. Stockpiled and conserved forages are used to cover these gaps. A tool to add to this toolbox is forage brassicas. They are annual crops with great nutritive value that are grazed starting 70 to 150 days after seeding, depending on the species and region of the country. In our conditions, when growing conditions were appropriate in the Fall, it was possible to start grazing them 55 days after planting. The leafy top of these forages is grazed, and the roots that contain protein and carbohydrates can be consumed if the animal can access them. This project aimed to evaluate under grazing conditions: 1) a mix of brassicas (turnip, kale, radish) as a forage source in the Fall transition period; 2) a mix of brassicas, legumes (red and white clover), and grasses (oats, cereal rye, and annual ryegrass) for Fall and Spring transition periods. With or without the addition of forages to the mix, brassicas constituted the greatest proportion of forage available in the Fall transition period (first 50-65 days of grazing depending on the year). Novelty played a role in the first 7-14 days of grazing and preference for radish was observed. Brassicas represented very little to nil of the standing forage from March to June; however, annual ryegrass but primarily red clover maintained a very good stand. Animal gains during the Fall transition period were greater when grazing these pastures than when hay was fed or stockpiled bermudagrass grazed. Rotational stocking in both experiments helped maintaining a healthy stand of brassicas until cold temperatures (and rainfall in 2 of the 3 years of evaluation) in late December to early February affected their survival.

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Cool-Season Annual Baleage: Fermentation Kinetics and Nutritive Value

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Baleage production is associated with a timely harvest and consistent nutrient quality when compared to hay. Harvesting at optimum maturity and ideal moisture will provide a quality feed source that can be stored for up to 12 months. The objective of this study was to determine the practicability of cool-season mixtures for baleage production. Wheat (*Triticum aestivum*) with T-Raptor (*Brassica rapa* × *napus*; WT) or crimson clover (*Trifolium incarnatum*; WC) were planted at the E.V. Smith Research Center in Shorter, AL as a 2 × 2 factorial design (n = 3). Forage was treated or un-treated with silage inoculant to determine its efficacy in promoting proper fermentation. Samples were taken at 7 different time intervals to determine fermentation characteristics and quality. There was no difference ($P \geq 0.1498$) in ADF concentration among treatments, but day 120 after ensiling was greater ($P \leq 0.0024$) than all other sampling dates. There was no difference ($P \geq 0.1108$) in NDF between forages, silage inoculant, or among days. The NDF was 50.75 % across forage treatments. The CP of the WC treatment was greater ($P \leq 0.0001$) than WT by 3.6 units. Inoculated was greater ($P \leq 0.0001$) than non-inoculated by 1.06 units. Crude protein was greater ($P = 0.0047$) on day 120 than day 0. Inoculated WT had greater ($P < 0.0001$) total acid content than non-inoculated (8.35 vs. 6.19 %, respectively). Wheat+clover had 1.5 units more total acid than WT. Inoculated had greater ($P \leq 0.0006$) total acid present than non-inoculated. Butyric acid concentration increased ($P \leq 0.0001$) with increasing days after ensiling. Butyric acid tended to be greater ($P = 0.0556$) in WC than WT, likely due to increased pH in clover treatments as a result of legume buffering capacity. The results indicate that silage inoculants offer minimal benefits to baleage fermentation when using cool-season annual mixtures.

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Monitoring of Horse Pasture Composition and Tall Fescue Toxicity in Kentucky

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Due to the value of horses in Kentucky and the widespread lack of agronomic experience among horse owners and managers, the UK Horse Pasture Evaluation Program has become a valuable monitoring program since its inception in 2005. To date, the program has performed 230 evaluations representing over 48,000 acres in Kentucky, primarily on thoroughbred broodmare farms. The primary objectives of the program include improving forage quality and quantity and reducing tall fescue toxicity. Based on the horse farms we have evaluated, pasture botanical composition has averaged 16% tall fescue (*Festuca arundinacea*), 25% Kentucky Bluegrass (*Poa pratensis*), 11% orchardgrass (*Dactylis glomerata*), 11% white clover (*Trifolium repens*), 23% weeds and 14% warm season annual grasses and bare soil. Most tall fescue plants (74%) are infected with a toxic endophyte, though some farms have begun to plant novel endophyte varieties. Ergovaline concentration in tall fescue has been shown to vary by year, time of year, management, and plant height. This program has shown that pastures with high ergovaline levels are likely to remain elevated in subsequent years. This suggests that ergovaline testing can help identify those pastures most likely to cause tall fescue toxicity in future years. However, management decisions should be made based on "Ergovaline in total diet", calculated from combining species composition and ergovaline analysis. The UK Horse Pasture Evaluation Program has successfully identified problematic pastures and recommended remediation strategies which have improved forage quality and quantity and the ability of those pastures to produce strong, healthy foals.

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Graze 300 VA

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More than 50% of cow/calf production costs are found in winter-feeding expenses according to Virginia Extension budgets. To improve profitability while also improving water quality, beef cow/calf producers can reduce their reliance upon hay feeding by adding additional days of grazing during the winter dormant season. Graze 300 VA is an educational initiative started in 2005 to address this issue and its significant potential for economic impact. Presently, a small group of producers in Virginia's Northern Piedmont and Northern Shenandoah Valley, regularly approach or achieve a 300-day grazing season. They extend their grazing season through adjustments in stocking rate and adjustments in pasture management. Having accomplished these needed changes, participants realize a 50% reduction in feed costs for each day of grazing added and a corresponding improvement in net revenue. The potential for additional net can be as high as $200 per calf sold when winter grazing is fully maximized. With over 96,000 beef cows in the Northern Shenandoah Valley and Northern Piedmont of Virginia, if 20% of the farmers (19,000 cows) improve economics by $100 per head per year, the benefit would be $1.9 million. Extending the grazing season will benefit water quality through improved water infiltration, improved nutrient use efficiency, fewer barren areas in fields from winter feeding sites, and improved soil organic matter. The Chesapeake Bay TMDL gives nutrient and sediment credit for every acre of pasture converted into a grazing management system and every foot of stream bank where livestock are excluded.

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Freeze Tolerance Protocol for Screening Tall Fescue Germplasm

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Tall fescue [*Schedonorus arundinaceus* (Schreb.) Dumort., nom. cons.], an introduced perennial cool-season grass, is receiving more interest from stocker cattle producers in the southern Great Plains of the United States who are looking to replace time- and labor-intensive annual cool-season grasses, such as cereal grains, with perennial forages that are less expensive and have fewer inputs. Improving freeze tolerance of tall fescue should result in greater winter hardiness and persistence. It would be advantageous to plant breeders to have a reliable, low cost tool for screening freeze tolerance of summer active (SA) and summer dormant (SD) tall fescue germplasm. Therefore, the objective of this study was to develop a protocol using controlled-environment freezing chambers to identify the appropriate temperatures (32 to 16°F) for plant breeders to make selections of SD and SA tall fescue germplasm (seedlings and tillered plants) that exhibit freeze tolerance. Two types of tall fescue, 'Texoma Max QII' (SA) and 'Flecha' (SD), were evaluated for freeze tolerance at both the seedling (1-2 leaves) and young, tillered (5-6 leaves) stages of growth. For both seedling and tillered plant experiments, two standard 23.0 ft^3 manual-defrost freezers with five shelves were used as freeze chambers. The target temperatures ranged from 32 to 16°F in 4°F increments. Plant trays remained in the freezer until target temperature was achieved. Plants were then moved to a 37°F cold acclimation chamber for 24 hr, then into the greenhouse to recover at optimal growing conditions (77°F) for 14 d. Alive (1) or dead (0) plants were counted to calculate percent survival. A logistic regression analysis was conducted to determine survival probability for seedlings and tillered plants as a function of temperature while controlling for each independent replication. The predicted temperatures where half of the plants survived and half died (LD_{50}) were 21.2°F and 22.1°F for Texoma Max QII and Flecha seedlings, respectively. LD_{50} was 20.8°F and 21.5°F for Texoma Max QII and Flecha tillered plants, respectively. Based on these results, a controlled temperature chamber appears to be a useful tool for plant breeders for evaluating SA and SD tall fescue germplasm for freeze tolerance.

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Heifer Development and Forage Evaluation in Silvopasture Systems

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Silvopasture – the intentional integration of trees with forages and livestock – may have the potential to increase land productivity and decrease the effects of heat stress on livestock. Two experimental silvopastures were developed from a thinned timber stand in Blackstone, VA, and seeded with a cool-season forage mixture to compare with an open pasture system. Treatment pastures include an open pasture, a thinned pine silvopasture, a thinned hardwood silvopasture, and a silvopasture that had been created by clearing and replanting both forages and loblolly pine in 2016. Cattle were introduced in 2017 and rotationally stocked within each system according to forage availability. Our objectives were to determine the forage availability, forage nutritive value, and the performance of heifers in silvopasture and open pasture systems. Forage availability was similar between treatments in 2017 (5035 lbs/ac); but lowest in the hardwood silvopastures (2981) compared to the other treatments (3242 lb/ac) in 2018. There was no significant difference in crude protein between silvo- and open-pastures (12.7%). In 2017, there were no differences in average daily weight gains between heifers in the four treatments (1.3 lb/day); in 2018, ADG was lower in hardwood silvopastures (0.8 lb/day) in contrast to other treatments (1.0 lb/day). Temperature loggers were used to remotely collect vaginal temperatures of the heifers over eight days in 2018. The heifers in the silvopastures had core temperatures of 102.9°F from 2 to 5 PM while heifers in the open pastures in contrast had an average core temperature of 104.0°F. A drone with a thermographic camera was also used to collect external hide temperatures in the morning and afternoon. Heifers in the silvopastures had lower heat loads in the afternoon than heifers in the open pastures. Overall, silvopastures may increase land use and product diversity while sufficiently meeting cattle requirements and benefiting animal welfare if resource competition is effectively managed.

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Characterization and Performance of Red Clover Accessions from the National Plant Genetic Resource Center in the Southern Great Plains

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Red clover (*Trifolium pratense* L.*)* is an important legume species for grazing and hay operations in the southern USA. Red clover is often inter-seeded into grass pastures to improve forage quality and yield. However, the persistence of red clover as a component of many pastures in the southern USA can be reduced due to disease, insect pressure or poor grazing tolerance. During the fall of 2016, the forage breeding group at the Noble Research Institute established a trial near Gene Autrey, OK, USA, in order to evaluate PI accessions from the National Plant Genetic Resource Center (NPGRC). The objective of this trial was to identify accessions that have a high breeding value for livestock and hay producers in the southern USA. A total of 30 PI accessions representing 13 originating countries, 20 synthetic populations from the Noble Research Institute's forage breeding program and 6 commercial check cultivars were included in the trial. One experimental arrowleaf clover (*Trifolium vesiculosum* Savi) population and two commercial arrowleaf clover checks were also included in the study. Red and arrowleaf clover plants were transplanted into an established pasture of Texoma MaxQ II tall fescue [*Festuca arundinaceum* (Schreb.) S.J. Darbyshire]. Trial design was a randomized complete block with four replications. Phenotypic data on leaf shape and size, stem hairiness, growth habit, spreading ability and flowering time were collected in early spring of each year of the trial. Plots were also evaluated for persistence under grazing by beef cattle in both 2017 and 2018. After two years of grazing, red clover stands ranged from 0 – 40% and arrowleaf clover stands ranged from 4 – 85%. Material selected from this trial will be integrated into the breeding program for the development of a persistent grazing cultivar for livestock producers in the southern USA.

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Temporary Electric Fencing Demonstration Kits for Increasing On-Farm Awareness about Grazing Management: A Case Study

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Using temporary electric fencing on beef cow-calf operations may improve forage use efficiency and increase producer focus on grazing management strategies. In fall 2018, Alabama Extension partnered with USDA NRCS Alabama to begin an on-farm demonstration program with producers on how to use temporary electric fencing. Producers were provided a starter grazing kit containing tread-in posts, polywire, a geared reel, fence charger, grounding rod, and fault finder, and asked to use this on stockpiled or actively growing cool-season pastures. Three on-farm demonstrations were started, and the data described is from a single on-farm demonstration site in Walker County, Alabama. This producer was asked to participate in a follow-up survey at the end of the grazing season, and hosted a grazing workshop at his farm to showcase the grazing kit to other producers. The survey focused on perceptions and awareness of grazing management practices after using the grazing kit. The producer had not used temporary fencing before this demonstration, but purchased the kit for replacement value, indicating he plans to continue using it. He used the kit to forward graze a mixed tall fescue/warm-season perennial grass pasture late in the fall, and cool-season annuals in the spring. Specifically, he reported greater ease of use of this system compared with feeding hay and supplement. Estimated time to move the fence was 30 minutes every three days compared with 90 minutes per day to feed hay during the winter, illustrating a significant time savings. During the one-day workshop hosted at the farm, participant evaluation data (n = 20) indicated an increase in knowledge regarding the topics of optimizing forage utilization, understanding pasture mapping, and pasture allocation. Participants reported that knowledge gained from this demonstration could potentially lead to a total farm economic impact of $10,950, with the average increase being $2,738. Knowledge gained from this program impacted a total of 1,125 acres and 656 head of livestock. These data demonstrate that on-farm programming efforts may be an effective tool for increasing awareness about grazing management practices in cow-calf operations, and may contribute to an increase in overall herd profitability.

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Establishing Warm-season Grasses and Wildflowers in Pastures for Mitigation of Tall Fescue Toxicosis and Native Bee Conservation

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Toxicosis from endophyte-infected tall fescue (*Schedonorus arundinaceus*) can decrease cattle productivity in summer months. Additionally, tall fescue is a cool-season grass that produces little biomass in July and August. Native warm-season grasses, such as big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), and Indiangrass (*Sorghastrum nutans*) can be highly productive in July and August and can provide an alternative source of forage. Since native warm-season grasses provide additional non-toxic forage, when used in conjunction with endophyte-infected tall fescue, they may reduce the effects of tall fescue toxicosis. Native warm-season grasses (NWSG) are prairie grasses that commonly grow alongside wildflowers. Wildflowers can provide native bee resources that are often lacking in cool-season grass pastures. Habitat loss is a primary driver of the decline of many once-common native bee species. Pasture land is 415 million acres of the agricultural land in the U.S. that could be used for both cattle production and pollinator conservation. To provide resources for native bees and an alternative forage for cattle, we planted the three previously listed NWSG species and 15 wildflower species in three two-acre pastures at the Virginia Tech Shenandoah Valley Agricultural Research and Extension Center in summer 2017. We found that adding wildflowers slightly enhanced native bee abundance and species richness when compared to cool-season grass pastures. However, the NWSG did not establish, meaning there was very little available forage for cattle and no opportunity for mitigation of tall fescue toxicosis. Beginning in summer 2019, we will test establishment methods of the three listed NWSG and nine wildflower species in a small-plot experiment replicated at two locations in Virginia. We will temporally and spatially separate the NWSG and wildflower plantings in a randomized completely blocked split-plot design. We will conduct the same establishment experiment with tall fescue. The goal of this experiment is to determine the optimal way to establish grasses and wildflowers in pastures to augment both cattle production and native bee conservation. Our results could have potentially wide-ranging impacts for mitigation of tall-fescue toxicosis and the conservation of native bees in the eastern U.S.

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