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Short communication

Stand characteristics of sericea lespedeza on the Louisiana Coastal Plain

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Abstract

Sericea lespedeza has been an important forage legume in portions of the USA for decades but has recently been recognized as invasive in some ecosystems. Stand characteristics potentially affecting usefulness and invasiveness were assessed on forested and open sites of a Louisiana Coastal Plain landscape. Typical heavy weed competition, which was not overcome by increased seeding rate or extent of seedbed preparation, occurred in full sunlight. An open longleaf pine canopy suppressed competitive herbaceous species and enhanced establishment compared to that in full sunlight. Shade of either longleaf pines or dense overstory of tall weeds reduced productivity but not stands. Sericea lespedeza spread was limited to a few meters during 7 years, apparently due to lack of an effective dispersal mechanism. Long stand life under mature longleaf pines and in the open field along with ability to re-colonize from soil seed reserves contribute to both usefulness of sericea lespedeza for conservation, forage, and wildlife habitat in agricultural landscapes and potential undesired persistence, especially with land-use changes to less intensive management, on Louisiana Coastal Plain landscapes.

Keywords: *Lespedeza cuneata*; Forage; Wildlife habitat; Invasiveness

1. Introduction

Sericea lespedeza [*Lespedeza cuneata* (Dumont) G. Don] is typically slow to establish resulting in poor stands under competitive conditions (Hoveland et al., 1990). Recent agronomic evaluations have shown that establishment can be improved with intensive approaches involving chemical weed control (Wehtje et al., 1999) along with thorough mechanical seedbed preparation. Widespread reports also indicate potential for unaided excessive establishment by this legume. Sericea lespedeza has recently been listed as the ''worst weed'' for Kansas, Oklahoma, Iowa, and much of Missouri (Wildland Invasive Species Team, 2002). Although still recommended for many uses in the southeastern USA, this legume has recently been listed as an invasive species in southern forests (Miller, 2003). Sericea lespedeza is the only widely adapted, perennial, warm-season legume with seed commercially available for forage, conservation, and wildlife habitat improvement in the southeastern states.

Field plot evaluations were conducted at Rosepine, Louisiana to assess agronomic and ecological responses to planting sericea lespedeza in a Coastal Plain forest and pasture landscape. Specific objectives were to assess aspects of establishment, adaptation, productivity, potential for plant spread, and re-establishment capability following thorough stand disturbance as affected by tannin level of divergent genotypes and to compare responses on open and forested sites. An overall goal was to obtain insights into the dilemma of whether sericea lespedeza is a beneficial species which should be recommended for use in pasture-forest ecosystems of the southeastern USA or an invasive pest to be regarded as an environmental hazard.

2. Materials and methods

Two field plot experiments were initiated in 1995 to provide distinctly different environments for assessment of

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sericea lespedeza on sandy loam uplands typical of the West Louisiana Coastal Plain. Soils were Malbis fine sandy loam (fine-sandy, siliceous, thermic Plinthic Paleudults). One site was an open, cultivated field (Experiment 1), and the other was within a previously thinned, 45–50-year-old, naturally regenerated longleaf pine (*Pinus palustris* Mill.) stand (Experiment 2). The two sites were located at the Rosepine Research Station near 30°57′N latitude and 93°20′W longitude.

In Experiment 1, the sericea lespedeza cultivars Interstate 76 and AU Lotan, which contrast in tannin levels, were evaluated in stands from three initial seeding rates and two seedbed treatments. The experimental design was a randomized complete block in four replications with a split–split plot arrangement of treatments. Main plots were seedbed treatments with lespedeza cultivars randomly assigned to subplots within seedbed treatments. Subplots of each cultivar were further split for the three seeding rates. Seeding rates were 10, 20, and 40 kg ha^{-1}. Seedbed treatments were a clean-tilled seedbed and the stubble from a grazed-out ryegrass stand, which was cut to an 8-cm stubble after it regrew to a 10–15-cm height. Seedbed treatments were 9 m × 18 m. Subplots of each cultivar were 9 m × 9 m with sub-subplots of each seeding rate 3 m × 9 m. Seed was broadcast by hand on 13 April 1995 and immediately packed. Initial soil analysis revealed 25 mg P kg^{-1}, 45 mg K kg^{-1}, 430 mg Ca kg^{-1}, 90 mg Mg kg^{-1} of soil, and a pH of 5.9.

Responses assessed were periodic visual stand ratings and herbage mass at one sampling date. Stand ratings were means of ratings by two observers taken on 28 June 1995, 17 September 1996, 29 April 1997, and 21 October 1997. These stand ratings were based on a scale of 0–9 with 0 indicating no plants present and 9 indicating a complete stand. Herbage mass was sampled on 31 October 1997 by clipping all lespedeza plants in a 1 m × 2 m area to ground level. One sample was taken per sub-subplot and subsampled for dry matter determination.

In Experiment 2, the two sericea lespedeza cultivars along with two annual lespedeza varieties were evaluated in plots within a longleaf pine stand. The two annuals were Marion striate lespedeza [*Kummerowia striata* (Thunb. ex Murr.) Schindler] and common Korean lespedeza [*K. stipulacea* (Maxim.) Makino]. Plots of the four varieties were arranged in a randomized complete block design with eight replications. Each plot was 3 m × 12 m with 2 m between plots. Initial soil nutrient levels were 30 mg P kg^{-1}, 50 mg K kg^{-1}, 300 mg Ca kg^{-1}, and 100 mg Mg kg^{-1} of soil with a pH of 5.8. The longleaf pine stand had been thinned to an average basal area of 11.5 m^2 ha^{-1} in the summer of 1986. The site was repeatedly tilled to prepare a seedbed in the spring of 1995. All four varieties were sown by hand at the rate of 30 kg ha^{-1} on 13 April 1995.

Responses evaluated include visual ratings of stands on 18 July 1995, 17 September 1996, 29 April 1997, 21 October 1997, 24 June 1998, 10 August 1999, and 19 June 2002 and herbage mass of varieties remaining in the 1997, 1998, and 1999 growing seasons. Herbage mass was assessed by clipping all lespedeza in a 1-m^2 sample in each plot to ground level on 3 November 1997, 20 July 1998, and 11 August 1999. These samples were subsampled for dry matter determination.

The pines were commercially harvested early in 2000 with only small portions of plots damaged by the harvest activities. The harvested area, including the lespedeza plots, was burned in the early spring of 2001 to remove debris from the harvest operation. Plots were monitored through the 2002 growing season when the final stand rating and visual assessments of plant spread were made. During the winter of 2002–2003, the area was repeatedly disked to facilitate piling and burning of tree limbs and roots. Stumps were also mechanically removed. The area was disked once in December 2003 to dislodge remaining roots for removal. During this period, the plot area was monitored for presence of re-establishing lespedeza plants. Before appearance of any lespedeza plants at the start of the 2005 growing season, two treatments were imposed over the original plot area in a strip plot arrangement of paired treatments. These extended across the width of the original plot area plus an additional 3 m on each side for a total distance of 24 m. Each of the 18 experimental units was 6 m wide for a total length of the plot area of 108 m with nine replications. The two paired treatments were a well-prepared, clean seedbed and an undisturbed, naturally developed diverse plant community of early successional species. On 27 July 2005, a diagonal transect across each of the 6 m × 24 m plots was assessed for presence of lespedeza seedlings. At 2-m intervals, lespedeza seedlings in a 0.5 m × 0.5 m quadrat were counted.

Stand ratings, herbage dry matter data, and plant counts in each experiment were analyzed by analysis of variance for each date. Where significantly ($P < 0.05$) different, LSD means separation procedures were used to assess differences among varieties. When responses to seeding rate in Experiment 1 were detected, regression analyses were used to assess response patterns.

3. Results and discussion

In Experiment 1, neither stand ratings nor herbage mass, which averaged only 500 kg ha^{-1}, differed ($P > 0.05$) between cultivars or seedbed treatments. At the initial stand rating date on 28 June 1995, a positive linear response ($R^2 = 0.19$, $P = 0.009$) to seeding rate was obtained with ratings ranging from 2.8 at the low seeding rate to 4.4 at the high seeding rate. In subsequent years, average stand ratings increased from 2.3 in September 1996 to 5.5 in October 1997 with no response to the initial seeding rate. There was also no response to the initial seeding rate in herbage mass at the 1997 sampling date.