Genetic and Environmental Variability in Sericea Lespedeza

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Introduction:

• Sericea lespedeza [*Lespedeza cuneata* (Dumont de Courset) G. Don] is an introduced summer perennial legume, known for its grazing, hay and conservation qualities.

• Introduced sericea possessed coarse stems resulting in low palatability and digestibility.

• Visual observations indicate that breeding has produced sericea lespedeza cultivars with more pliable stems but these observations have not been corroborated by measurements.

• Information on plant growth characteristics of old and more recently released cultivars is very limited.

• Previous studies have shown that temperature has a significant effect on early growth of sericea lespedeza genotypes.

• Additional research is needed to study genetic (cultivars) and environmental factors (temperature) affecting growth characteristics of sericea lespedeza.

Objective:

• To study growth and regrowth characteristics of five cultivars of sericea lespedeza at three temperature regimes.

Materials and Methods:

• Experiment was conducted using plants of three old and two new cultivars of sericea lespedeza namely Okinawa, Serala, Arlington, AU Lotan, and AU Grazer at Plant Sciences Research Center, Auburn University.

• Plants were grown under growth chamber conditions at three day-night temperature combinations (32/19°C, 28/15°C, and 24/11°C) which are normally reported in Alabama.

• Five plants per cultivar were grown in each pot with five replications for each cultivar. Two cuttings were made on the plants, each time when they reach at 35 cm height.

• Experimental design followed was split-split plot with cut as a repeated measurement.

• Different response variables measured at each harvesting were stem thickness, stem dry weight, leaf dry weight, leaf percentage.

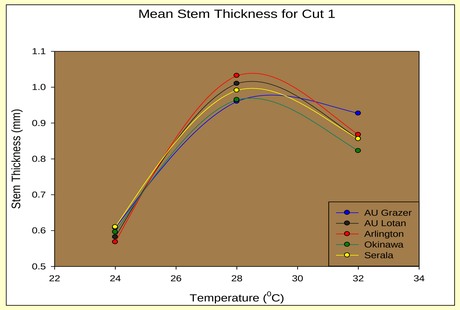

Fig. 1

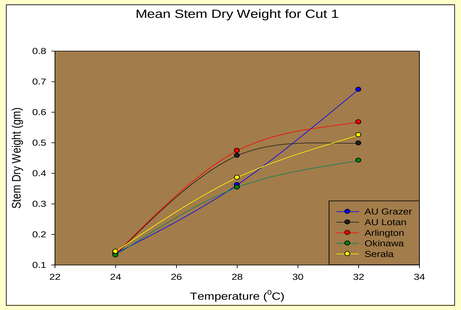

Fig. 2

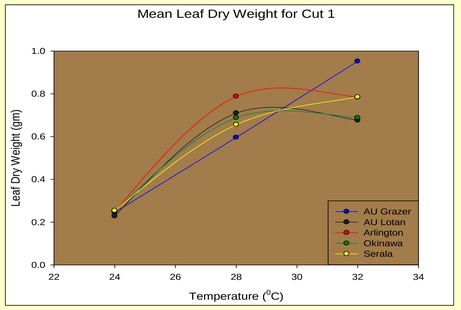

Fig. 3

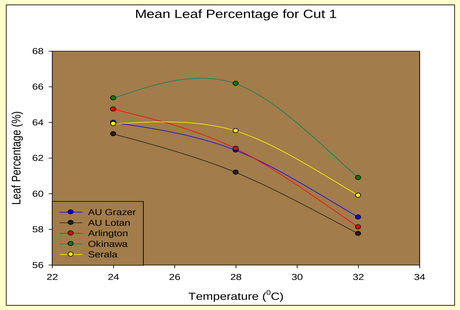

Fig. 4

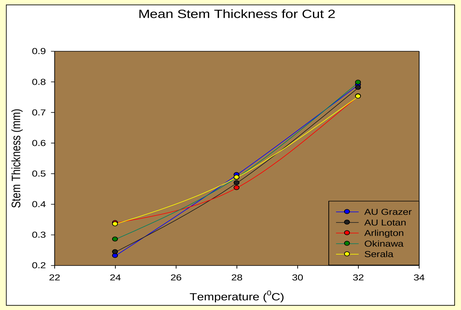

Fig. 5

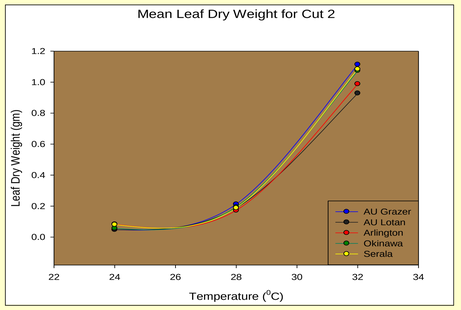

Fig. 6

Regression equations representing behavior of five cultivars at three temperature regimes for cut 1 for:	
STEM THICKNESS (ST)	STEM DRY WEIGHT (SDW)
ST (AU Grazer) = -0.96082 + 0.715025*Temp - 0.012056*Temp^2	SDW (AU Grazer) = 0.642 - 0.087*Temp + 0.00275*Temp^2
ST (AU Lotan) = -14.1996 + 1.0521*Temp - 0.018175*Temp^2	SDW (AU Lotan) = -7.76392 + 0.54172*Temp - 0.00886*Temp^2
ST (Arlington) = -15.4187 + 1.137638*Temp - 0.019647*Temp^2	SDW (Arlington) = -7.0244 + 0.48165*Temp - 0.007638*Temp^2
ST (Okinawa) = -12.352 + 0.9229*Temp - 0.015975*Temp^2	SDW (Okinawa) = -4.014 + 0.27325*Temp - 0.004187*Temp^2
ST (Serala) = -12.53 + 0.9351*Temp - 0.01615*Temp^2	SDW (Serala) = -3.4626 + 0.227225*Temp - 0.003206*Temp^2
LEAF DRY WEIGHT (LDW)	LEAF PERCENTAGE (LP)
LDW (AU Grazer) = -1.728 + 0.07775*Temp + 0.000188*Temp^2	LP (AU Grazer) = 27.20307 + 3.181061*Temp - 0.068672*Temp^2
LDW (AU Lotan) = -13.5 + 0.959*Temp - 0.016125*Temp^2	LP (AU Lotan) = 49.39741 + 1.541703*Temp - 0.040017*Temp^2
LDW (Arlington) = -14.4244 + 1.01965*Temp - 0.017012*Temp^2	LP (Arlington) = 31.82784 + 3.019606*Temp - 0.068683*Temp^2
LDW (Okinawa) = -11.5802 + 0.821575*Temp - 0.013694*Temp^2	LP (Okinawa) = -67.65835 + 10.11865*Temp - 0.190672*Temp^2
LDW (Serala) = -7.8994 + 0.544775*Temp - 0.008544*Temp^2	LP (Serala) = -1.496706 + 5.146629*Temp - 0.100873*Temp^2

Regression equations representing behavior of five cultivars at three temperature regimes for cut 2 for:	
STEM THICKNESS (ST)	LEAF DRY WEIGHT (LDW)
ST (AU Grazer) = -0.7332 + 0.018*Temp + 0.000925*Temp^2	LDW (AU Grazer) = 14.562 – 1.15825*Temp + 0.023063*Temp^2
ST (AU Lotan) = 0.6928 - 0.08305*Temp + 0.002681*Temp^2	LDW (AU Lotan) = 11.808 – 0.94*Temp + 0.01875*Temp^2
ST (Arlington) = 3.5492 - 0.272908*Temp + 0.005798*Temp^2	LDW (Arlington) = 14.816 – 1.159125*Temp + 0.022719*Temp^2
ST (Okinawa) = 1.369 - 0.12705*Temp + 0.003412*Temp^2	LDW (Okinawa) = 14.8324 – 1.17275*Temp + 0.023212*Temp^2
ST (Serala) = 1.7672 - 0.143525*Temp + 0.003494*Temp^2	LDW (Serala) = 16.008 – 1.255375*Temp + 0.024656*Temp^2

Materials and Methods (Cont.):

• Stem thickness was measured at the time of harvesting while remaining parameters were evaluated after freeze drying them for 48 hours.

Results and Discussion:

Stem Thickness:

Main effects of temperature, cut and their interaction were significant (P<.0001). However, cultivar and cultivar-cut interaction were not significant. Temperature had a significant quadratic effect for cut 1 (P<.0001) (fig. 1)and cut 2 (P=.0131) (fig. 5).

Stem Dry Weight and Leaf Dry Weight:

Main effects of temperature, cut and their interaction were significant (P<.0001). Temperature × cultivar was also significant. Temperature produced a significant quadratic effect for Stem Dry Weight at P=.06 for cut 1 (fig. 2) and P<.0001 for cut 2. For Leaf Dry Weight, temperature had a significant quadratic effect for both the cuts (fig. 3 and 6).

Leaf Percentage:

Main effects of temperature, cultivar and cut were significant (P<.0001). Temperature × cut interaction was also significant. Significant quadratic effects of temperature were observed at P=.07 for cut 1 (fig. 4) and P<.0001 for cut 2.

Conclusions:

• Differences in morphological characters is mainly due to temperature and cut.
• AU Grazer produced a linear trend for Stem Dry Weight and Leaf Dry Weight
• Responses tend to diverge more at higher temperature.

Future Research:

It is important to study these cultivars under field conditions. Hence, the future work will focus on analyzing the field data (already taken) for the morphological characters measured in growth chamber.

Literature Cited:

• Kalburtji, K. L., J. A. Mosjidis and, A. P. Mamolos. 2007. Effects of day-night temperature combinations under constant day length on emergence and early growth of sericea genotypes. Can. J. Plant Sci. 87: 77-81.
• Mosjidis, J. A. 1990. Daylength and temperature effects on emergence and early growth of sericea lespedeza. Agronomy J. 82: 923-926.