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Native, Perennial, Warm-Season, Herbaceous Legumes for the Cross Timbers

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Summary and Application

Perennial, herbaceous native warm-season legumes were evaluated to determine forage yield, crude protein (CP), and seed production. Fifteen entries were planted in 2000 and evaluated in 2001 and 2002. The species evaluated were yellow puff neptunia (*Neptunia lutea*), tropical neptunia (*Neptunia pubescens*), prairie acacia (*Acacia angustissima*), prairie bundle-flower (*Desmanthus leptolobus*), velvet bundle-flower (*Desmanthus velutinus*), Illinois bundle-flower (*Desmanthus illinoensis*), sharp-pod bundle-flower (*Desmanthus acuminatus*), scarlet-pea (*Indigofera miniata* var. *leptosephala*), downy milk-pea (*Galactia volubilis)*, tall bush-clover (*Lespedeza stuevei*), trailing bush-clover (*Lespedeza procumbens*), Tweedy's tick-clover (*Desmodium tweedyi*), Nuttall's tick-clover (*Desmodium nuttallii*), American snout-bean (*Rhynchosia americana)* and Texan snout-bean *(Rhynchosia senna* var. *texana*). Sub-plots were harvested after flowering or the plants had reached the perimeter of the 3 ft X 6 ft plot and continued to be harvested monthly until the end of the season. Prairie acacia and yellow-puff neptunia had forage yields over 4,500 lbs/acre/year. Both tall and sharp-pod bush-clovers had forage CP concentrations below 12% while sharp-pod and prairie bundleflowers had CP concentrations over 20%. Average seed yields from unharvested plants, measurable on only 8 entries, were greatest for Illinois and prairie bundleflowers. All entries maintained seed production and improved forage yield after perenniating the third season.

Introduction

Pasture and range comprise about 90% of the agricultural land use in the south-central USA (Greene, 1997; Anonymous, 1995). Summer pasture forage quality for this region is often insufficient to meet the nutritional needs of livestock and wildlife. Legumes are known for improving soil fertility by fixing atmospheric nitrogen and producing forage with high protein content (Iglesias and Lloveras, 1998). Legumes can also have double the CP concentration of grasses without the need for expensive N fertilizers (White and Wight, 1984).

Native warm-season herbaceous legumes from the Texas Cross Timbers are potentially useful for native prairie and woodland restoration, deer plots, goat browse, and cattle pastures. These native legumes provide food and protection for wildlife; they also increase forage quality for livestock during the warm season (Osman et al., 2002). At present, native warm-season herbaceous legumes are not being widely seeded in rangelands and cultivated pastures to compliment native and introduced grasses. Illinois bundleflower cv. Sabine and showy partridge-pea (*Chamaecrista fasciculata*) are the only native legumes commercially available and both have limitations in forage distribution (Sabine is productive only in early summer) or palatability (partridge pea is rejected by most herbivores).

The objectives of this study were to evaluate forage yield and nutritional value as well as seed production of 15 herbaceous, perennial legumes native to the Texas Cross Timbers.

Methods and Materials

The data was collected at the Stephenville Texas Agricultural Experiment Station during the spring and summer of 2001 and 2002. Fifteen perennial, native, warm-season herbaceous legumes originally collected in the Cross Timbers were evaluated to determine forage and seed yields as well as forage nutritional value. Irrigation was applied up to monthly 30-year precipitation averages. Plants were divided into harvest and no-harvest subplots, the latter used for measuring seed yields. Forage CP was determined from sub-plots harvested throughout the season at intervals of thirty days, once plots were covered, at a 4 in. stubble-height. Forage yield per acre was estimated from per plant yields during the second year of the trial when most plants were three years old and would be the equivalent of growing these legumes in pure stands with no weed competition. Seed production was measured on no-harvest subplots throughout the season by manually collecting ripened pods.

Results and Discussion

May-October (growing season) rainfall in 2001 was 11 in., 40% below the 30-year average, and 23 in. in 2002, 25% above the 30-year average. There were year by entry interactions for seed and forage yields, so these values are reported for the high rainfall year when plants were well established. The CP values are an average of both years.

Seed Yield

Illinois and prairie bundle-flowers both produced about the equivalent of 700 lbs seed/acre/year on unharvested plants (Fig. 1) while other entries produced considerably less.

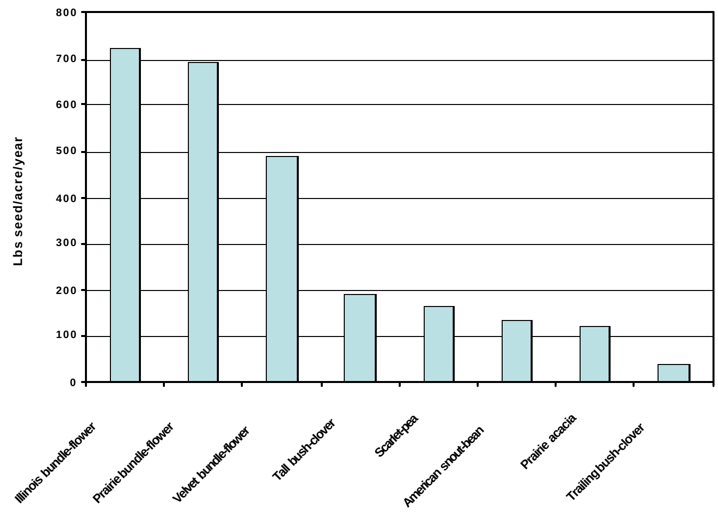

Fig. 1 Seed yields per unharvested plants averaged over the two-year trial period ($LSD_{0.05}$=106) estimated from a per plant basis.

Forage Production

During the last year of the trial, most of the legumes produced over a ton of forage per acre equivalent as measured on per plant basis, indicating that these species, when present in significant populations, can contribute considerable forage (Fig. 2).

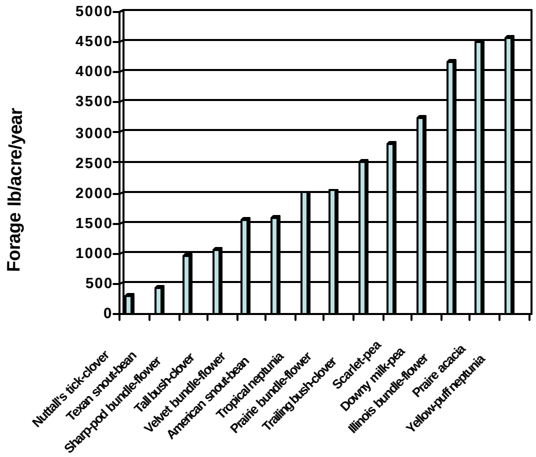

Fig. 2 Forage yields of three-year old native, herbaceous legumes ($LSD_{0.05}$ = 25) estimated from a per plant basis.

Prairie acacia and yellow puff neptunia had the greatest forage yields. Texan snout-bean and Nuttall's tick-clover both produced less than 500 lbs/acre/year equivalent.

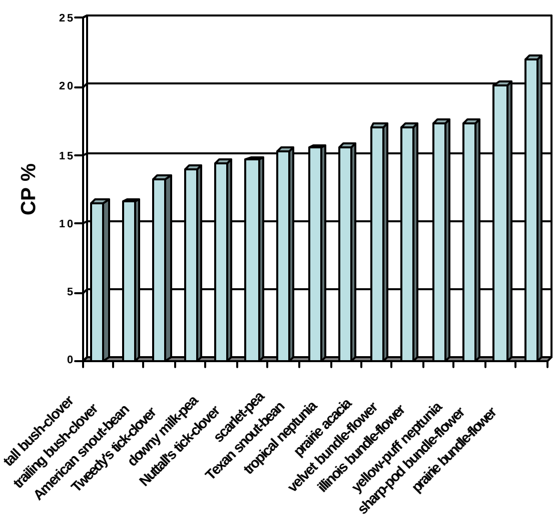

Fig. 3 Forage crude protein concentration averaged over the two-year trial period ($LSD_{0.05}$= 3.4).

Crude Protein

Crude Protein was highest in prairie bundle-flower at 22% over the two-year period while sharp-pod bundle-flower had the second highest CP level at 20% (Fig.3). Both bush-clovers had low CP levels, close to 11%.

Conclusions

Seed yield is important for stand persistence, seedling recruitment or feeding game birds. Most of the entries where seed production was measurable produced sufficient amounts of seed to guarantee soil seed banks, even if predation by insects, rodents or birds occurs. The next question that needs to be studied is whether game birds find these seeds palatable and nutritious.

Quality and quantity of forages is of greater importance when feeding white-tailed deer or domesticated herbivores. The CP levels in the legume species were generally good, especially among the bundle-flowers. At these levels, even if forage yields are low, they will contribute considerably to the nutrition of browsing herbivores capable of harvesting leaves and growing points that have the greatest concentration of digestible nutrients.

Three of the entries studied had forage yields per plant equivalent to over 2 tons/acre/year. Illinois bundle-flower is notable for being among the greatest forage and seed producers. In others, there appears to be a trade-off in forage and seed yield, so producers may have to choose species according to their production priorities. Species with superior forage production and high CP concentration will be more appropriate for white-tailed deer plantings while species that produce high seed yield would be more useful for quail or turkey. Those interested in improving nutrition of both white-tailed deer and game birds would have to choose entries that compromise between seed and forage production or plant mixtures of species.

Except for Illinois bundle-flower cv. Sabine, none of these species are presently

available on a commercial basis.
Techniques for maximizing seed production and harvest need to be developed. If wildlife enthusiasts and those purely interested in re-establishing native prairie and woodland bio-diversity show an interest, there may be a huge market for these native Texas legumes in the near future.

Indigofera miniata
Scarlet pea

Desmanthus illinoensis
Illinois bundleflower

Desmodium tweedyi
Tweedy's tick-clover

Lespedeza stuevei
Tall bush-clover

Rhynchosia americana
American snout-bean


Desmodium nuttallii
Nuttall's tick-clover


Desmanthus acuminatus
Sharp-pod bundleflower


Desmanthus velutinus
Velvet bundleflower


Rhynchosia senna var. *texana*
Texan snout-bean


Desmanthus leptolobus
Prairie bundleflower


Galactia volubilis
Downy milk-pea

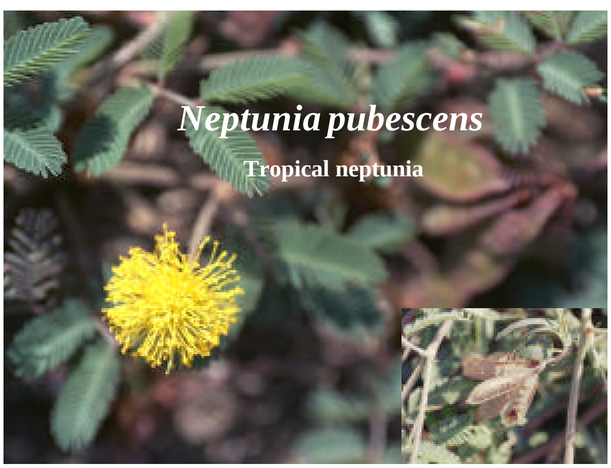

Fig. 4 Native Texas herbaceous legumes used in the two year trial with scientific and common names.

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