

SERICEA LESPEDEZA: FACTS FOR BIOLOGY TEACHERS

Summary of the **Sericea Lespedeza**

Symposium held at Emporia State University

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BIOLOGY OF SERICEA

Sericea is a long-lived perennial legume that grows from two to five feet tall and undergoes the most vegetative growth in April through July. It has many stems called ramets and is covered with fine, silky hairs (sericeous) near the tips. "Sericea lespedeza" is not the scientific name of the plant but a common name based on being a lespedeza with silky hairs on its leaves. The leaves are trifoliate like clover, but the leaflets are wedge-shaped. It flowers in late fall and is a short-day plant with critical photo period of less than 14 hours. It is mostly self-pollinated but 2-13% of the flowers may be open-pollinated; the latter is favored by long days and high temperatures. It produces up to 1500 seeds per stem which can result in 200-400 pounds of seeds per acre per year. From ten to fifteen percent of the seeds produced will germinate the following year. The remainder are "hard" and contribute to establishment of a seed bank in the soil. Dormancy of seeds may be broken by freeze-thaw cycles, ingestion by animals, or fire. There can be up to an 88% increase in germination following fire. Ideal germination conditions require temperatures above 70° F. The plant is well adapted to poor soils that are high in lime. These are the kinds of soils found in the Flint Hills. Nitrogen-fixing nodules are present on the roots. Because of their nitrogen fixing potential, sericea is planted with fescue as a forage crop in the Southeast U.S. However, tannin production in the leaves is high and increases with age and high temperature. The tannins inhibit utilization of forage by cattle. A few studies have shown that the plant is not allelopathic to the germination of some forage grasses, but it does appear to decrease the growth rate of grass plants. It's photosynthetic rate is roughly half that of alfalfa, but it is less affected by water stress or drought than alfalfa. Sericea's growth is "slow but sure."

Eighty meter square study plots were examined in Southeastern Kansas, half in a non-infested field and half in a heavily-infested field. In the non-infested plots, 12 species of grass and 27 species of forbs were considered important; 79% of the coverage consisted of grass species. In the infested plots only four grasses, mostly big bluestem, and seven forbs, mostly weedy species, were present. Of the few species present, 84% of the coverage was sericea with an average of 524 stems per square meter. The yield of grasses and forbs from uninfested plots averaged 400 g/m² in 1996 and 425 g/m² in 1997. Corresponding yields in the infested plots were 91 g/m² and 56g/m² respectively. In the non-infested plots, 68 species of insects were found while only 25 species were found in infested plots. In summary, the presence of sericea results in a reduction of species diversity, a decrease in forage productivity, and has a detrimental impact on wildlife habitat. Infested fields eventually end up a near monoculture of the weed. **-Joan Young and Tom Eddy, ESU**

Discussion; The plants typically begin seed production in the second year. Seeds probably remain in the seed bank for 15-20 years. Sericea is apparently a shade tolerant species.

"Sericea lespedeza" is not the scientific name of the plant but a common name based on being a lespedeza with silky hairs on its leaves.

BRIEF HISTORY OF SERICEA IN KANSAS

Sericea--technically known as *Lespedeza cuneata*--is a legume native to China, Japan and Korea. It was introduced into the U.S. in North Carolina in 1896 in order to control erosion and to provide forage. It made its way into Kansas in the 1930's, again for use in erosion control and to provide wildlife habitat. By 1987 it was recognized as a problem spreading in the eastern third of the state. Not only was it spreading, but livestock would not eat it. Worse yet, there was no information available on how to control the weed. The first aerial surveys to estimate coverage were taken in 1987-88 and in 1988 House Bill 2623 was passed making it a county-option noxious weed. Surveys carried out from 1991 through 1997 demonstrate an exponential increase in the acreage infested with the weed. In 1991, approximately 50,000 acres were affected in eight counties in the eastern third of the state. By 1997 this had increased to more than 275,000 acres through the eastern one-half of the state and including some western counties. This increase is probably the result both of better reporting, as more and more landowners learn to recognize the plant, and spread of the weed. In 1997 House Bill 2289 was introduced to list sericea as a noxious weed statewide. It would require landowners to control infestations and would provide matching financial assistance to do so.

-Bill Scott, Kansas Department of Agriculture

Table 1. Percent of sericea control after the indicated time.

Treatment	Rate	One Month	One Year	Two Years
<i>Remedy</i>	0.5	100	94	97
<i>Ally/Escort</i>	0.18	25	86	83
Mow	at vegetative	63	35	43
Mow + <i>Remedy</i>	0.25	73	72	84

SERICEA RESEARCH AT K.S.U.

Studies began in 1988 in Woodson County when sericea was declared a noxious weed. Control measures considered included: biological (grazing); mechanical (mowing); prescribed burning; and chemical. Studies concentrated on the latter. Initial studies examined a variety of herbicides, including some not labeled for range usage, with June and August applications. These studies indicated that *Remedy* and *Ally/Escort* showed the most promise, either with or without additional 2,4-d. *Remedy*, at 0.5-1.0 lb./acre, resulted in 91-97% kill after one year. *Ally/Escort*, at 0.19-0.5 lb./acre, resulted in 88-90% kill. *Remedy* has the additional advantage of showing "burn-down" of the tops within two weeks after treatment so it is easy to see where treatment was done.

Sericea has a large taproot system with well-developed fibrous roots near the surface. A study of carbohydrate storage in the root/crown region showed a dramatic decrease in late summer coincident with the onset of flowering. During the early, vegetative growing season, carbohydrate accumulation varied with environmental conditions, especially moisture. With the onset of flowering, there is sustained increase in storage reserved until first frost. It is also at this late state of the growing season that new buds are formed on the crown of the plant. These developments provide storage reserves to support new bud break from the crown the following spring. These data suggest that the mature plant may be most susceptible to a variety of treatments just before the onset of flowering.

Recent studies have concentrated on integrated control measures involving burning, mowing and herbicide application. When mowed, sericea resprouts within seven weeks. In treatments involving mowing and herbicide application, chemical was applied seven weeks after mowing. Initial results are summarized in Table 1 for an unburned site with moderate infestation at 50-100 stems/m².

Mowing decreases production of all plants, including warm season grasses. Herbicide application not only decreases the presence of sericea, but produced a 24% increase in productivity of warm season grasses compared to the control.

In 1996, an early burn was added to the protocol, followed by mowing and herbicide application. Burning and burning+mowing was not effective; the burn, mow, herbicide treatment was similar to mow+herbicide alone.

Some problems that are recognized include: 1)there is poor control of herbicide application, especially with aerial application, and 2)there is need for retreatment every 2-3 years.

Future studies will include examination of herbicides with longer residual, effects of spray volume, and seed bank studies.

-**Walter Fick**, Department of Agronomy, K.S.U.

Discussion: If burning stimulates germination, it may be useful to reduce the seed bank. The present cost of herbicide application runs \$12-15 per acre. Most plants (75-80%) surviving treatment are new seedlings, but some older plants survive. Herbicide application will reduce the diversity of forbs in the treated field.

TESTS DEMONSTRATIONS IN SOUTHEASTERN KANSAS

As early as 1952-53, sericea was being sold in southeastern Kansas to improve the native grass for forage. Kilgore first identified it in the field in 1966 and as recently as eight years ago it was being harvested for seed in southeastern Kansas (for sale in Arkansas). It is usually first found in draws and in the shade of trees. it is "remarkably free of damage from insect pests and disease." Seedling growth rates depend on soil depth and water availability and in southeastern Kansas it takes 2-4 years for a plant to begin producing seed. In an ongoing, long-term study, "banked" seeds are still sprouting after eight years of continuous control. Herbicide treatments have included a number of chemicals, both listed and non-listed, for range management. The most effective are currently *Crossbow*, *Remedy*, and *Ally/Escort*. *Crossbow* is a mixture of *Remedy* plus 2,4-d; it is cheaper to tank mix your own. Tests of June, July and September applications showed no significant differences. The most important thing is that the plants must be actively growing when herbicide is applied to achieve satisfactory results. Lower rates are effective on very small seedlings, 1-2 inches tall, but a second crop will germinate and become established before fall unless a second spraying is done. With *Ally/Escort* you must use a non-ionic surfactant as recommended on the label. *Remedy* provides broader control of other broad leaf weeds, such as ragweed, whereas *Ally/Escort* does not. Plants that appear to be dead after 12 months may still be viable and bud out after 18 months!

-Gary Kilgore, Extension Specialist, K.S.U.

Discussion: With late season application, *Ally/Escort* appears to have some residual effect on seedling germination the following year. Both of these herbicides are translocated to the growing points of the plant where they have their effect.

BURNING SERICEA

Acreage that is hayed regularly appears to be less affected by sericea. The worst infestations occur in gullies and areas that are periodically flooded. Out thought was to mimic mowing with fall burning in those areas that are periodically flooded. A fall burn, followed by a spring burn, seemed to be effective in controlling stands of established sericea. A study in progress involves an October burn of 160 acres. Pre-burn inventory was done in July. At that time the site contained nine grass species, ten non-desirable forbs, and four species of shrubs. All of the study sites contained big bluestem and sericea. The association index between these two species was 0.96 (on a scale of 0-to-10). In terms of productivity, sericea produces 1,800 lb./acre; big bluestem averaged 1,200 lb./acre; all other desirable species produced 36 lb./acre; all other undesirable species contributed 50 lb./acre. Coverage by sericea was 58%; big bluestem accounted for 40%; all other desirable species were 1%. In a typical uninfested field, big bluestem coverage is 49% and all other desirable species account for 45%. However, the bluestem present in the infested field was shorter and appeared less vigorous than normal.

Conclusions: 1)traditional burning is not effective; 2)traditional grazing is not effective, even double stocked; 3)desirable forbs are already gone once sericea becomes established in a field, therefore the problem of herbicides reducing desirable forbs is minimal; and 4)there is a strong association between big bluestem and sericea.

-Kenny Whitehead, Crops of Engineers; **Tom Eddy**, **Jim Mayo**, and **Joan Young**, E.S.U.)

Discussion: Traditional burning releases seeds from the seed bank, therefore burning probably favors sericea. Bluestem prairies were historically burned at any time of the year.

USING GOATS TO CONTROL SERICEA

Rogers has an 18-acre test plot near Lebo, Kansas, that is now in its fourth year of trials. The goats preferentially browse sericea, other weeds such as ironweed, and brush. They do not eat grass. However, there are some problems: 1)how do you keep the goats in when they crawl and jump, 2)how do you protect goats, especially the baby goats, from predators, 3)you must control for parasites two to three times per year, and 4)where do you sell the goats? There is no nearby market, but the current price for goats is better than for cattle.

The project began in 1995 with the simple questions "Will goats eat sericea?" Twelve goats were brought in and they averaged 21 lb./head gain during the growing season. In 1996, three different breeds of wethers were used. On average, the 19 Spanish goats gained 9.9 lb., the 23 Angoras gained 7.4 lb., and the 15 Alpine gained 10.3 lb. per head. In 1997, sixty doelings reached a maximum gain of 13 pounds by the end of September, but then began slow weight loss. The 90 wethers gained 22 lbs. in the same time, then began to lose. This experiment was done to see how long goats could be maintained because the market for goats is best near the holidays, therefore it is ideal to hold them in the field as long as possible. For a heavily infested field, a rate of 15-20 goats per acre seems to work. After three years, only seedlings of sericea can be found; all mature plants have been eliminated. Similarly, all of the ironweed and black locust have also been killed. During the period of 1980-1996, the market for goats has been increasing. In 1996, 800,000 head were sold at \$110-120 per head or about \$0.60 per pound.

-Don Rogers, Rancher from Lebo, KS; **Nelson Escobar**, Langston University, Langston, OK.

Discussion: You can run goats on the same land as cattle; they feed on different plants. About 5-6 goats are supported by the same acreage as one cow.

INTENSIVE GRAZING MANAGEMENT TO CONTROL WEEDS

Herbicides and mowing are "last ditch" efforts to control weed pests because they are too expensive. Intensive grazing is effective but it requires a philosophical change. You must look at individual animal performance and you must spend time managing the land. It requires that you plan ahead and always be looking at least two weeks down the road. With 1000 head on 40 acres, the cattle may be moved as often as every day to minimize stress on the land. Russell's operation is currently running two cells of 32 paddocks each.

Although some say intensive grazing "is not the cowboy way" and is "untraditional" (it requires putting fences in, not taking them out), the idea is actually based on history. When large herds of buffalo moved across the rangelands, they grazed heavily on the land, then moved on and didn't return to that area until it had regrown. In the same way, overgrazing of cattle has nothing to do with the number of livestock, it has to do with time: "get em on and get em off."

In managing the land, you are concerned primarily with the three inches of plant above ground and the two inches below ground. Sericea is simply a symptom of poor range health. If the land is overgrazed, there will be too much bare space between individual plants which provides a place for weeds to take hold. To control these weeds broadcast a handful of salt into the weeds to attract grazing animals to that area. Let them graze down the weeds, then move the animals off to let the grass recover. After

90-100 days, rotate them back.

-**Jerry Russell**, Ranch Manager, Piedmont, KS

Discussion: Each paddock is only grazed about four days out of the entire summer and the rotation begins at a different paddock every year. Two pounds of salt "goes a long way."

MANAGING SERICEA ON NATURE CONSERVANCY LANDS

The Nature Conservancy is an international, non-profit organization dedicated to preserving remnants of natural ecosystems. The Konza and Flint Hills Prairie are two preserves in Kansas; Tall Grass Prairie Preserve is a 38,000-acre unit, 20% wooded, in the Osage Hills of Oklahoma and is the southern extension of the Kansas Flint Hills. Management is driven by the mandate to maintain biological diversity by mimicking natural processes and pressures. Techniques include late October burns, which are generally lower intensity because of the amount of green material. They are now in their sixth burn season and more than 96,000 total acres have been fall burned. They also graze buffalo; 300 head were introduced in 1993 and they are now at 1250 head with a goal of building the herd to 2200 head. The buffalo graze intensely on recently burned areas.

Sericea was first noticed about 1994, especially on disturbed sites such as along the roads and in former buffalo wallows. Adjacent landowners began spraying. The Conservancy began spot spraying with *Remedy*. This has been done primarily on the 800-1000 acres around the headquarters site. They spray mostly late in the season when the native forbs are already senescing. Flushes of sericea occurred following both spring and fall burns and while the buffalo are later drawn to these areas, they graze on the grasses but leave the sericea untouched. There are also cattle on the property and they will graze on the early growth of young sericea until about June. In September of 1996, twenty individual sericea plants were measured and all juveniles counted within a ten meter diameter circle around each mature plant. Ten were in a burn area and ten were an unburned control. After scoring, the test field was burned. 1996 was a dry year so there was nearly complete combustion. One year later all the adults in the burn area were eliminated and there was a 65% reduction in the number of juveniles and a 38% decrease in the total number of stems. In the control area, there was a 14% height increase in the mature plants, a 15% increase in the number of juveniles and a 3% increase in total number of stems.

-**Bob Hamilton**, Tall Grass Prairie Preserve, Pawhuska, OK

POLITICS AND ECONOMICS

Hearings on sericea began about ten years ago and resulted in the current county option noxious weed status. The recently passed House Bill 2289 was amended in the Senate to include a provision for research money to study the problem. The amended bill was (at the time of this conference) in conference committee and Senator Karr sits on that committee. Most of the concerns that have been raised are from those who market hay and from seed dealers.

-State Senator **Jerry Karr**, Reading, KS; **Brian Landis**, Vice-president Appraisals, Federal Farm Credit Services; **Maurice Erickson**, Chair, Natural Resource Commission for Kansas Livestock Association.

Discussion: Is there a reduction in market value of land due to sericea? There have not been sufficient sales of prime pasture at this time to apply the Paired Market Value appraisal. Those that have sold have been poorer quality or with recreational or urban impact. So far, the market appears strong, but mostly due to strong demand and "ignorance." Using the Estimated Cost-to-Cure Method, we are likely to see a reduction in rental rates before a reduction in land prices. So far the rental rates are strong, but the potential to reduce the carrying capacity will have a strong impact. Infestation with sericea would be treated as a management issue.

Mr. Erickson has been double-stocking 17,060 acres for the last several years. In January 1997 he lost 1600 rental acres to sericea. It sold for \$410 an acre when the average in this area had been \$400 to \$500 per acre. So far, there do not seem to be major negative effects on cattle weight gain. In 1997, 2100 head averages a gain of 274 pounds per head over 84 days on uninfested land; 200 head in an infested field averaged a gain of 238 pounds per head. Sericea was first seen in his fields in the late 1970s in haying pastures. They used spot treatment of *Crossbow* or *Remedy* to try to control it. In 1996, 320 acres were aerial sprayed with *Remedy* + 2,4-d in mid-July. There was excellent control of hedge and approximately 95% kill of sericea, but there was regrowth in 1997. It cost \$18.35 per acre. In 1997, 850 acres (plus an additional 15,000+ acres of neighboring fields) were sprayed with *Escort* from September 16 to October 15. You could see the damage before the first frost hit, but it is too early to evaluate the long term effectiveness. *Escort*, being a powder, is easier to handle than *Remedy*. The bottom line is this: "Do not let it get established... ."

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STUDENT TEST

1. Sericea is a "pest" plant in Kansas because it:
A)withdraws nitrogen from the soil.
B)has a higher photosynthetic rate than other plants.
* C)it is drought-resistant and supplants grasses.
D)it moves fields away from being a monoculture of grasses and promotes a diversity of forbs.
2. Sericea prefers soils that are:
* A)high in lime.
B)dry and undisturbed.
C)rich in nitrogen.
D)all of the above.
3. If you spray and kill the sericea plants, more appear the next year because:
A)seeds are dispersed from far away.
B)the roots live to send out runners.
* C)many seeds are produced and remain in the seed bank for years.
D)the seeds are dispersed by passing through cattle.
4. If sericea is high in nitrogen-fixing, why is it not a good pasture plant?
A)It produces tannins and cattle won't eat it.
B)It doesn't chemically combat other plants but it does decrease growth of nearby grasses.
C)The reduction in other plants reduces the plant productivity of the rangeland.
* D)All of the above are correct.
5. Sericea was originally found in China, Japan and Korea. What is a logical biological statement?
A)This is why there are few cattle herds in Asia.
B)It was purposely introduced to damage the U.S.
C)Sericea is just as big a farm problem in Asia.
* D)More pests and competitors of sericea might be found in Asia.
6. From Table 1, it is obvious that:
A)Remedy is the most economical treatment.
* B)Remedy was the most effective treatment.
C)Chemicals plus mowing add the effectiveness of both methods over all time periods.
D)All methods are of roughly equal effectiveness after two years.
7. Since herbicides are expensive, the fact that very small seedlings of sericea die after lower application rates would seem to make control cheaper. Why is this not true?
A)Sericea soon becomes immune to lower rates.
* B)A second crop germinates and requires a second spraying.
C)Spring spraying kills all the good grasses too.
D)Spring spraying reduces all forage for cattle.
8. If goats like to eat sericea, what is the problem incorporating them into Kansas pastures?
A)There is no nearby market.
B)Baby goats must be protected from predators.
C)Goats are harder to keep enclosed.
D)Goats need treatment for parasites.
* E)All of the above are concerns.
9. To entice cattle to decrease the amount of weeds:
A)cattle must be trained to recognize weed species.
B)cattle must be fenced in with weed patches.
* C)a handful of salt can be tossed on weeds.
D)the grass must be made distasteful by adding salt.
10. If sericea is not a serious problem in its native Asia, why is it a problem in the United States where it was introduced?
A)Asian grasses are more hardy.
* B)Sericea is freed from native pests and diseases in the U.S.
C)Sericea is probably the most efficient and productive plant in the world but Asia has poor soils.
D)Asia raises huge numbers of goats.
E)Asians use huge amounts of herbicides.

ESSAY:

A. Compared with grazing land and prairie used for hay, will sericea be a major problem for cultivated agricultural cropland such as farming corn?

Answer: No because the cultivating and harvesting procedure will interfere with the establishment of mature plants and the development of a seed bank.

B. Why do laws or regulations requiring farmers to control lespedeza on their land not work to eliminate the plant from Kansas?

Answer: 1)Sericea lespedeza invades land that may not be farmed, 2)control methods are minimally effective, 3)the seed bank lasts for over a decade, and 4)biology respects natural laws but not human laws.

C. If this pest plant originated in China, why is it not likely a serious problem for farmers there?

Answers: 1)China is intensively cultivated and peasants can individually weed it out; 2)most land is pressed into agricultural crops and little can be spared for grazing animals (which are less common in the diet), and 3)we can expect to find more natural enemies for the plant in the region where it evolved.

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