

ELEMENT STEWARDSHIP ABSTRACT

for

Lespedeza cuneata (Dumont-Cours.) G. Don

Sericea Lespedeza, Chinese Bush Clover

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THE NATURE CONSERVANCY

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SCIENTIFIC NAME

Lespedeza cuneata (Dum.-Cours.) G. Don

Synonyms:

Anthyllis cuneata Dum. Cours.

Aspalathus cuneata D. Don

Hedysarum sericeum Thunb.

Lespedeza juncea var. *sericea* Forbes & Hemsl.

Lespedeza sericea Benth.

Lespedeza sericea Miq.

COMMON NAMES

Sericea lespedeza, Chinese bush clover, silky bushclover, Himalayan bushclover and hairy lespedeza are all common names often associated with *Lespedeza cuneata*. Several cultivars, including 'Common Sericea', 'Arlington', 'Serala', and 'Interstate' were introduced in the Midwest and eastern U.S. for forage and erosion control (McCarthy 1896; Stitt 1943; Ohiwi 1965; Clewell 1966; Kartesz 1994a,b).

DESCRIPTION AND DIAGNOSTIC CHARACTERISTICS

Lespedeza cuneata is an aggressive warm-season perennial legume (in the family Fabaceae/Leguminosae). It is a shrubby, copiously branched plant with ascending stems. The plant can reach a height of two meters in loamy soils and has an extensive taproot that can extend up to 120 cm or more. Juvenile plants have only one stem that can have many top branches. In winter, food reserves are stored in the underground taproot and old stems die back. New stems arise from root crown buds in early spring and increasing numbers of stems are produced each year. A single plant is able to form a large stand that can live over 20 years (Bare 1979; Correll et al. 1979; Barkley 1986).

L. cuneata can be distinguished by leaf shape, flower color, and by its general growth form. *L. cuneata* is the only species within the genus *Lespedeza* with cuneate or wedge-shaped leaf bases. Flowers are creamy-white with purple throats. When mature, *L. cuneata* has numerous tall, coarse stems that grow in bunches. Juveniles of *L. cuneata* can be distinguished from the closely related slender lespedeza (*L. virginica*, a native) by its large coarse stems (versus few weak stems) (Clewell 1966; Bare 1979).

Leaves of *L. cuneata* are trifoliate and have a short petiole (usually 0.0 to 0.5 mm long). Each leaflet is 5 to 25 mm long and 1.5 to 6 mm wide, with densely flattened hairs that give a grayish-green or silvery appearance. The apex of each leaflet is rounded or truncate, and bears a small, pointed tip. Leaflet bases are cuneate (wedge-shaped). Thread-like or awl-shaped stipules, typically 3 to 11 mm long, are also present.

L. cuneata blooms from July through October, and has flowers of two types: chasmogamous (petaliferous) flowers or cleistogamous (apetalous) flowers. Petals of the chasmogamous flowers are typically cream-white to yellow-white in color, and the upper-most (banner) petal can have

pink- or purple-colored veins. The calyx is 3 to 4 mm long. Chasmogamous flowers grow in clusters of 1 to 4 flowers per leaf axis. Cleistogamous flowers of *L. cuneata* are always self-fertilized (versus cross-fertilized in chasmogamous flowers), typically do not open, and do not have showy petals. Cleistogamous flowers have a calyx 1.5 to 2.0 mm long and are generally scattered amongst the chasmogamous flowers (Pieters 1934; Stitt 1946; Hanson & Cope 1955b).

Fruits of *L. cuneata* are 3 to 5 mm long and are glabrous or with appressed hairs. Seeds are shiny, slightly flattened, ellipsoid to oval, and are either tan, olive, purple, or a mottled brown color. Seeds from the two flower types can easily be distinguished from each other by their shape and size (McKee & Hyland 1941; Cope 1966a,b, 1971).

PEST STATUS

L. cuneata is considered an invasive weed in rangelands and grasslands of the Midwest and eastern United States, and is listed as a noxious weed in Kansas and Colorado. It is also listed on the Southeast Exotic Pest Plant Council's List as a Category 1 species, indicating that it is known to be invasive and persistent throughout all or most of their range within the Southern Region. In some parts of the U.S., *L. cuneata* is still valued for controlling erosion along roadsides and for forage, and a websearch in November 2002 yielded several nurseries and seed companies (mostly in the southeast and eastern U.S.) that offer *L. cuneata* for these purposes.

STEWARDSHIP SUMMARY

L. cuneata is an aggressive species that was introduced from Asia for use as forage and hay production on poor soils, and for erosion control in the southeastern United States. It can flourish where other plants have difficulty growing, such as on eroded, infertile soils. It is drought resistant, is rarely bothered by insects or disease, produces numerous seed and abundant forage, and is a long-lived perennial. Because of these characteristics, *L. cuneata* was first introduced and highly valued by agronomists for crops, forage, and soil conservation in the 1940s.

L. cuneata grows well in grasslands, pastures, along roadsides, drainage areas, fence rows, and in other disturbed areas. Mature stands of *L. cuneata* are difficult to control in natural areas. The deep root system makes removal of the plant by digging or pulling extremely difficult. Extensive cutting efforts (by mowing or plowing) are generally not feasible, as *L. cuneata* typically grows in rough, rocky areas. Such cutting efforts may also greatly disturb native plant populations.

Spring burns are not effective for controlling the spread of *L. cuneata*, as new shoots sprout almost immediately after fire. Dormant season controlled burns can also promote *L. cuneata*. Fire scarifies seeds of *L. cuneata*, promoting germination and seedling establishment on open, bare ground.

L. cuneata is not susceptible to several common herbicides, such as 2,4-D, picloram, and dicamba. Triclopyr, glyphosate, clopyralid, and metsulfuron methyl, however, have been shown to be effective in the control of *L. cuneata* (Griffith 1996; Peterson et al. 1996; Remaley 1998).

L. cuneata is best controlled by an integrated management approach that combines mechanical and chemical methods. Late summer burns can decrease adult plant vigor, remove seeds from that year, and decrease seedling survival. Similarly, mowing plants in the flower-bud stage for two to three consecutive years can reduce the vigor of stands and control further spread. Good control can be achieved by mowing followed by a herbicide treatment in early to mid summer. A 2% solution of triclopyr or a 0.5% solution of clopyralid is effective during the vegetative stage prior to branching or during flowering. In wet sites, a 2% solution of glyphosate is effective from late June to seed set (Remaley 1998).

RANGE

L. cuneata is native to Asia and Australia. It is a common native plant in Korea, China, Taiwan, India, Australia, and on the Japanese islands of Hokkaido, Honshu, Shikoku, and Kyushu (Ohiwi 1965). It was introduced to the southeastern United States in the 1800s for forage and soil conservation. It has also been introduced to South Africa, Brazil, Canada, and Mexico (Pieters 1934; Donnelly et al. 1970; Hoveland & Donnelly 1985).

In the United States, *L. cuneata* occurs in Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, West Virginia, and Wisconsin (Pieters 1934; Donnelly et al. 1970; Barkley 1977; USDA-NRCS 2002).

IMPACTS & THREATS POSED BY *LESPEDEZA CUNEATA*

L. cuneata establishes readily on eroded and disturbed soils, or in nutrient poor soils. It thrives on bottomland sites, and can become a major problem along roadways, drainages, trails, and at burned sites. Its deep taproot enables it to outcompete native plants for water and nutrients, especially during periods of prolonged drought.

Although originally introduced as a forage plant, *L. cuneata* has stems that become tough and unpalatable unless kept continually mowed or grazed. The number of stems produced by each plant increases each year, until large pure stands are formed that can take over entire fields. In natural areas, these stands can become so dense that native plants are reduced. *L. cuneata* also produces chemicals, such as tannins, that can inhibit the growth of other plants and promote the formation of pure stands of *L. cuneata*.

L. cuneata is still used for erosion control along highways and around reservoirs, and is planted as cover for quail. *L. cuneata* readily escapes from cultivation into native grasslands and agricultural areas, and can seriously impact natural areas.

HABITAT

L. cuneata is adapted to a wide range of conditions. It is cultivated for pasture, from which it often escapes, and may also be found in grazed woodlands. Large areas of rangeland have been seeded with this and other forage species. In its native range in Asia, *L. cuneata* grows on exposed ground and grassy lowlands (Ohiwi 1965). In North America, *L. cuneata* occurs in disturbed habitats such as along roads, ditches, railroad tracks, and other moist disturbed places. It is often found as a weed in cultivated areas, fallow and abandoned fields, meadows, and marshes.

L. cuneata is adapted to a wide range of climatic conditions, is tolerant of drought, and grows best where annual rainfall is over 76 to 89 cm (30 to 35 in). It prefers winters that are dry and summers that are wet (Guernsey 1970). Stands of *L. cuneata* can survive freezing winter temperatures, but are often damaged by late spring freezes (Helm & Etheridge 1933). *L. cuneata* can survive flooding for up to ten days in cool, moving water, but cannot survive prolonged periods submerged in warm water (Guernsey 1970).

L. cuneata can grow in shallow soils, but grows best in deep soils, such as deep sands with organic matter or sandy loams with clay loam subsoil. It has successfully invaded the deep, well-drained loess soils of Mississippi, Tennessee, Kentucky, and the deep red soils of the Piedmont Plateau (Appalachian Highlands). *L. cuneata* will also grow on strongly acidic to neutral soils, but prefers soil pH of 6.0 to 6.5 (Guernsey 1970).

ECOLOGY & BIOLOGY

L. cuneata is a shrubby aggressive perennial. Its competitive ability and persistence are increased by a lack of continuous grazing, burning at inappropriate times, high rates of disturbance, and by the allelopathic compounds it produces. It colonizes bare ground and grassland areas, and strongly competes with native species. *L. cuneata* can invade open, natural communities and displace native species. It grows best in deep well-drained soils with adequate moisture, and is somewhat suppressed in shallow soils. *L. cuneata* can sprout from root buds after burning or mowing, and a combination of burning, herbicide application, and mowing is required for adequate control of this weed.

Vegetative Growth

L. cuneata can reproduce by seeds, as well as spread vegetatively, forming dense stands with many upright stems. Mature plants begin growth earlier in spring than most other plants. Crown buds produce new shoots each year, which are tender and succulent until they reach a height of 30 to 38 cm (Guernsey 1970; Hoveland & Donnelly 1985). Older stems become coarse and woody unless they are continuously mowed or grazed (Blair 1933; Ball & Donnelly 1985). Plants have only one stem the first year, but the density of stems increases with the age of the plants. Dense stands of *L. cuneata* may produce 5 to 30 stems in four years, and isolated plants have been documented to produce over a hundred stems (Blair 1933). Stands can live for over 20 years, and regrowth following clipping is from lateral buds (Helm & Etheridge 1933; Hoveland et al. 1975).

Flowering & Fruiting

Flowers of *L. cuneata* typically bloom from July to October in the U.S., with the production of chasmogamous flowers preceding the production of the cleistogamous flowers. Daylength, amount of light available, and temperature determine the quantity of each type of flower produced, and numbers of seeds produced (McKee & Hyland 1941; Bates 1955; Ohiwi 1965; Donnelly & Patterson 1969).

Seed production is also affected by weather conditions, pollination of the chasmogamous flowers by honeybees and other insects, and the time and frequency of cutting treatments (Ansley 1960; Cope 1966a; Guernsey 1970; Adamson 1973; Donnelly 1979). Greater numbers of seeds are generally produced in years with high rainfall and in years when bee populations are high.

Clipping or grazing during the growing season lessens seed yields. Frequent cutting increases the proportion of cleistogamous flowers, and therefore, reduces the proportion and absolute number of chamogamous seeds produced (Ansley 1960; Adamson 1973; Donnelly 1979).

Seed & Seedling Biology

L. cuneata reproduces both vegetatively and sexually. The seeds produced from by chasmogamous (outcrossed) flowers do not germinate well unless they are scarified (Blair 1933).

Temperature and daylength affect rates of seedling emergence and rates of seedling growth (Pieters 1934; Bates 1955; Mosjidis 1990). The optimum temperature range for germination is 20° to 30° C (Qiu et al. 1995). Seedling emergence is reduced 20% with each 3° C reduction in day/night temperatures (Mosjidis 1990). Seedling growth is best at 26°/22° C day/night temperatures and at 13 to 15 hour daylengths.

Hybridization

Little crossing occurs among different species of the genus *Lespedeza* (Pieters 1934). *L. cuneata* can produce viable hybrids from crossings with *L. latissima*, *L. inschanica*, and *L. hedsaroides* (Hanson & Cope 1955a). No viable hybrids, however, have been obtained from crosses between American perennial *Lespedeza* species and other Asian *Lespedeza* species, or when perennial *Lespedeza* species attempt to hybridize with annual *Lespedeza* species. Hybrids were also not viable when crossing between species with different chromosome numbers (Brinkley et al. 1959).

ECONOMIC & OTHER USES

Forage

L. cuneata was widely planted in the southeastern U.S. as early as the 1900s as forage for livestock. This warm-season perennial forage has high yields and tolerates a wide range of different soil, temperature, and moisture conditions. Cattle prefer *L. cuneata* new growth with fine pliable stems and low tannin content, and eat seeds before frost. *L. cuneata* provides good forage for goats; it is however, not good forage for dairy cattle or for hogs (Hawkins 1959; Schmidt et al. 1982).

Allelopathic compounds in *L. cuneata*, such as tannins, inhibit the growth of other plants while also making it unpalatable to animals. The leaves of *L. cuneata* are higher in tannin content than

the stems, and the upper portions of the plant tend to be higher in tannin content than the lower stems (Minton 1951). As the plant ages, levels of tannins also increase, and grazers will often cease to feed on *L. cuneata* if other palatable forage is available.

Wildlife

L. cuneata is not an important food for native birds or mammals. Some herbivores will eat *L. cuneata*, but only early in the season when shoots are tender or when no other food is available. As the plants age, tannin content within the plant increases and the stems become more coarse, woody, and unpalatable.

L. cuneata is sometimes used as cover for wildlife on crop fields bordering woods. *L. bicolor* (bicolored lespedeza, an exotic) is often planted next to woods with *L. cuneata* planted along the remainder of the border (Davison 1945; Clewell 1966; Guernsey 1970). Quail, grasshopper sparrows, meadowlarks, and greater prairie chickens have been documented to build nests in *L. cuneata* plants and bobwhite quail consume seeds of *L. cuneata* (Davison 1945).

Planting & Reclamation

L. cuneata is planted for erosion control and soil conservation on roadways, waterways and outlets, dams, field borders, strip mine spoils, and other places that are easily eroded. Thick stands of *L. cuneata* are usually not achieved, however, for several years. Quick growing grasses (generally exotics) are usually planted to protect the soils from erosion until *L. cuneata* can develop large stands. Black locust (*Robinia pseudoacacia*) has also been planted with *L. cuneata* on strip mine spoils (Guernsey 1970; Wright et al. 1978). *L. cuneata* should not be planted where it can easily spread into adjacent prairie and other natural grasslands.

MANAGEMENT

Potential for Restoration of Invaded Sites

The potential for large-scale restoration of wildlands infested with *L. cuneata* is probably low, unless the entire area is continually treated for several consecutive years. Complete elimination of *L. cuneata* is difficult. If control efforts are applied when the infestation is still small, there is a moderate to high potential for restoration.

Spraying can kill mature plants, but large numbers of viable seeds can remain in the seed bank for several years. Pastures and rangelands must also be monitored for several years to determine if *L. cuneata* is completely destroyed. Disturbed areas have a high potential for invasion by *L. cuneata*. Plants are difficult to identify in the first year of growth and can develop into large stands before they are noticed. It is difficult to find and spray all the plants in an area. Unless the continued planting of *L. cuneata* along highways and around reservoirs is stopped, it will be extremely difficult to control.

Integrated Management

The best control of *L. cuneata* combines both mechanical and chemical treatments. Hand pulling is impractical due to its extensive perennial root system, but mowing plants at the flower bud

stage for two to three consecutive years can significantly reduce the vigor of stands as well as control further spread. Mowing followed by a herbicide treatment is likely the most effective option for the successful control of *L. cuneata*.

Cultural Controls

The increasing range of *L. cuneata* can be slowed if it is no longer sold or planted as erosion control along highways or around reservoirs. Its use as a forage plant should also be halted. Listing of *L. cuneata* as a noxious species will facilitate stopping its spread.

Herbicide

Most current management procedures require the use of herbicides to control the growth and expansion of *L. cuneata*. Metsulfuron methyl (Escort[®]), triclopyr (Garlon[®]), clopyralid (Transline[®]) and glyphosate (RoundUp[®]) are some herbicides that are known to control *L. cuneata*. Herbicide should be applied to *L. cuneata* in early to midsummer, during the flower bud stage. A 2% triclopyr solution or a 0.5% clopyralid solution is effective in controlling *L. cuneata* during the vegetative stage prior to branching or during flowering. In wet sites, a 2% solution of an aquatic-approved glyphosate formulation (Rodeo[®], Aquamaster[®]) is effective from early summer until seed set (Remaley 1998).

Prescribed Burning

Prescribed burning, by itself, does not control populations of *L. cuneata*. Spring burns actually stimulate resprouting and encourage seed germination. Even so, prescribed burns applied late in the season and in combination with other control methods can help control *L. cuneata*. Late season burns decrease mature *L. cuneata* vigor, remove that year's seeds, and decrease seedling survival. Following a late season burn, herbicide can be applied, then mowed for good control results.

MONITORING

In natural areas management, monitoring programs will likely need to assess changes in abundance of both *L. cuneata* and desirable native species as well as other changes in desirable community attributes. Such programs should have explicit objectives that can be measured and that are meaningful from both a biological and management standpoint. Monitoring the status of other conservation targets, such as invertebrates dependent on specific nectar sources, may be more important than tracking invasives. In general, the monitoring objectives should support and conform to the management objectives.

Monitoring change in both untreated and treated areas can be an effective and powerful way of determining whether or not any detected changes have resulted from management activities. Since *L. cuneata* acts as an early successional species in some systems, declines in abundance may occur over time without management.

RESEARCH

Further research is needed on the impacts of *L. cuneata* on natural areas, and on the effects of *L.*

cuneata control programs on native species, especially where grassland communities are conservation targets. More information is also needed on selective control measures. Field experiments with timing of burns, different grazing or mowing regimes, and herbicide combinations are also needed. Several insects may damage *L. cuneata* (e.g., the three-cornered alfalfa leaf hopper (*Spissistulus festinus*), grass army worms (*Pseudodaleta unipunta*), grasshoppers (*Schistocerca americana*) and the lespedeza webworm (*Tetralopha scortealis*)), but more needs to be learned before they could be intentionally augmented or released to control the plants (Guernsey 1970; Hoveland & Donnelly 1985; Jones 1987).

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REFERENCES CITED

- Adamson, H. C. 1973. Influence of cutting and irrigation on seed and forage yields, chasmogamy, and seed weight of Interstate sericea lespedeza, *Lespedeza cuneata* (Dumont) G. Don. Unpubl. M.S. thesis, Auburn Univ., Alabama, 57 pp.
- Ansley, W. 1960. The influence of time and frequency of cutting on persistence, forage, yield, seed yield, and seed type of sericea lespedeza. Unpubl. M.S. thesis, Auburn Univ., Alabama, 63 pp.
- Ball, D. M. and E. D. Donnelly. 1985. Sericea lespedeza for grazing, hay, or conservation. Auburn Univ. Coop. Ext. Serv. Circ. ANR-445, 11 pp.
- Bare, J. E. 1979. Wildflowers and weeds of Kansas. The Regents Press of Kansas, Lawrence, Kansas, 509 pp.
- Barkley, T. M. 1977. Atlas of the flora of the great plains. The Great Plains Flora Assoc., Iowa

- State Univ. Press, Ames, Iowa, 600 pp.
- Barkley, T. M. 1986. Flora of the great plains. Great Plains Flora Assoc., Univ. Press of Kansas, 1392 pp.
- Bates, R. P. 1955. Effects of photo-periods on plant growth, flowering, seed production, and tannin content of *Lespedeza cuneata*. Agron. J., 47:564-567.
- Blair, E. C. 1933. Lespedeza in North Carolina. North Carolina Agri. College Ext. Cir. 195, (Rev. 1937), 8pp.
- Brinkley, R. M., C. H. Henson, and W. A. Cope. 1959. Growth and morphological characters of induced autotetraploids of *Lespedeza cuneata*, *L. stipulacea*, and *L. stricta*, and infertility of these species at diploid and tetraploid levels. Agron. J., 51:143-147.
- Clewell, A. F. 1966. I. Identification of the *Lespedeza's* in North America. II. A selected bibliography on lespedeza. Tallahassee, Fla., Tall Timbers Res. Sta. Bull. No. 7, 29 pp.
- Cope, W. A. 1966a. Cross-pollination in sericea lespedeza. Crop Sci., 6:469-470.
- Cope, W. A. 1966b. Growth rate and yield in sericea lespedeza in relation to seed size and outcrossing. Crop Sci., 6:566-568.
- Cope, W. A. 1971. Expression of heterosis in sericea lespedeza with competitive vs. noncompetitive plant spacing. Crop Sci., 11:761-763.
- Correll, D. S., M. C. Johnston, and Collaborators. 1979. Manual of the vascular plants of Texas, 2nd print., Univ. of Texas at Dallas, Richardson, Texas, 1881 pp.
- Davison, V. E. 1945. Wildlife values of the *Lespedezas*. J. of Wildl. Mgmt., 9:1-9.
- Donnelly, E. D. 1979. Selection for chasmogamy in sericea lespedeza. Crop Sci., 19:528-531.
- Donnelly, E. D. and R. M. Patterson. 1969. Effect of irrigation and clipping on seed production and chasmogamy of sericea lespedeza genotypes. Agron J., 61:501-502.
- Donnelly, E. D., R. Dickens, D. G. Sturkie, and J. D. Miller. 1970. Interstate sericea lespedeza--a multi-purpose legume. Auburn Univ. Exp. Sta. Leaflet 80, 8 pp.
- Griffith, C. 1996. Sericea lespedeza--a friend or foe? AG News and Views, 14(10):4.
- Guernsey, W. J. 1970. Sericea lespedeza, its use and management. U. S. D. A. Farmers Bull. 2245:1-29.
- Hanson, C. H. and W. A. Cope. 1955a. Interspecific hybridization in *Lespedeza*. J. Hered.,

46:233-238.

- Hanson, C. H. and W. A. Cope. 1955b. Reproduction in cleistogamous flowers of ten perennial species of lespedeza. *Amer. J. of Bot.*, 42:624-627.
- Hawkins, G. E. Jr. 1959. Nutritive qualities of sericea lespedeza forage. Alabama Polytec. Inst. Agri. Exp. Sta. Bull. 318, 19 pp.
- Helm, C. G. and W. C. Etheridge. 1933. *Lespedeza sericea lespedeza* the newest legume for Missouri. Univ. of Missouri Agri. Exp. Sta. Bull. 331, 15 pp.
- Hoveland, C. S. and E. D. Donnelly. 1985. The *Lespedezas*. Pp. 128-135, in *Forages: The science of grass agriculture* (M. E. Heath et al, eds.). Fourth ed. Iowa State Univ. Press, Ames, Iowa.
- Hoveland, C. S., W. B. Anthony, E. L. Carden, J. K. Boseck, and W. B. Webster. 1975. Sericea lespedeza-grass mixture. Auburn Univ. Agri. Exp. Sta. Circ. 221, 12 pp.
- Jones, J. D. Jr. 1987. Response of sericea lespedeza to herbicides and weed-control systems. Unpubl. M.S. thesis, Auburn Univ., Alabama, 155 pp.
- Kartesz, J. T. 1994a. A synonymized checklist of the vascular flora of the U. S., Canada, and Greenland, Vol. I, Checklist. Second ed. Biota of N. A. Program of the No. Carolina Botanical Garden, Timber Press, Inc., Portland, Oregon, 622 pp.
- Kartesz, J. T. 1994b. A synonymized checklist of the vascular flora of the U. S., Canada, and Greenland, Vol. II, Thesaurus. Second ed. Biota of N. A. Program of the No. Carolina Botanical Garden, Timber Press, Inc., Portland, Oregon, 622 pp.
- McCarthy, G. 1896. Hairy *Lespedeza*.-- *Lespedeza sericea lespedeza* . North Carolina Agri. Exp. Sta. Bull. 133, pp 339 & 346.
- McKee, R. and H. L. Hyland. 1941. Apetalous and petaliferous flowers in *Lespedeza*. *Amer. Soc. Agron. J.*, 33:811-815.
- Minton, E. B. 1951. Tannin content of individual plants of various strains and species of perennial *Lespedeza*. Unpubl. M.S. thesis, Auburn Univ., Alabama, 46 pp.
- Mosjidis, C. O., C. M. Peterson, and J. A. Mosjidis. 1990. Developmental differences in the location of polyphenols and condensed tannins in leaves and stems of sericea lespedeza, *Lespedeza cuneata*. *Anns. of Bot.*, 65:355-360.
- Ohiwi, J. 1965. Flora of Japan, (In English), Translation of Flora of Japan, 1953. Smithsonian Institution, Washington D. C., 1067 pp.
- Peterson, D. E., D. L. Regehr, P. D. Ohlenbusch, W. H. Fisk, P. W. Stahlman and D. K.

- Kuhlman. 1996. Chemical weed control for field crops, pastures, rangeland, and non-cropland. Manhattan, Kansas, Agri. Exp. Sta. Kansas State Univ., SRP748, p 52.
- Pieters, A. J. 1934. The little book of *Lespedeza*. The Colonial Press, Washington D. C., 94 pp.
- Qiu, J., J. A. Mosjidis, and J. C. Williams. 1995. Variability for temperature of germination in sericea lespedeza germplasm. *Crop Sci.*, 35:237-241.
- Remaley, T. 1998. Plant Conservation Alliance, Alien Plant Working Group: Chinese *Lespedeza*. Available at: <http://www.nps.gov/plants/alien/fact/lecu1.htm> (Accessed November 7, 2002).
- Schmidt, S. P., E. D. Donnelly, C. S. Hoveland, and R. A. Moore. 1982. Steers make good gains grazing sericea lespedeza and alfalfa. *Auburn Univ. Agri. Exp. Sta. Highlights of Agri. Res.*, 29(4):4.
- Stitt, R. E. 1943. Variation in the tannin content of clonal and open-pollinated lines of perennial lespedezas. *J. Amer. Soc. of Agron.*, 34:944-954.
- Stitt, R. E. 1946. Natural crossing and segregation in lespedeza, *Lespedeza cuneata* (Dumont) G. Don. *J. Amer. Soc. of Agron.*, 38(1):1-5.
- Wright, D. L., R. E. Blaser, and J. M. Woodruff. 1978. Seedling emergence as related to temperature and moisture tension. *Agron. J.*, 70:709-712.
- USDA, NRCS. 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA. (Accessed November 7, 2002)

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