

# UNIVERSITY OF KENTUCKY

COLLEGE OF AGRICULTURE

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CIRCULAR NO. 297

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## THE LESPEDEZAS IN KENTUCKY



A field of lespedeza hay.

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Lexington, Ky.

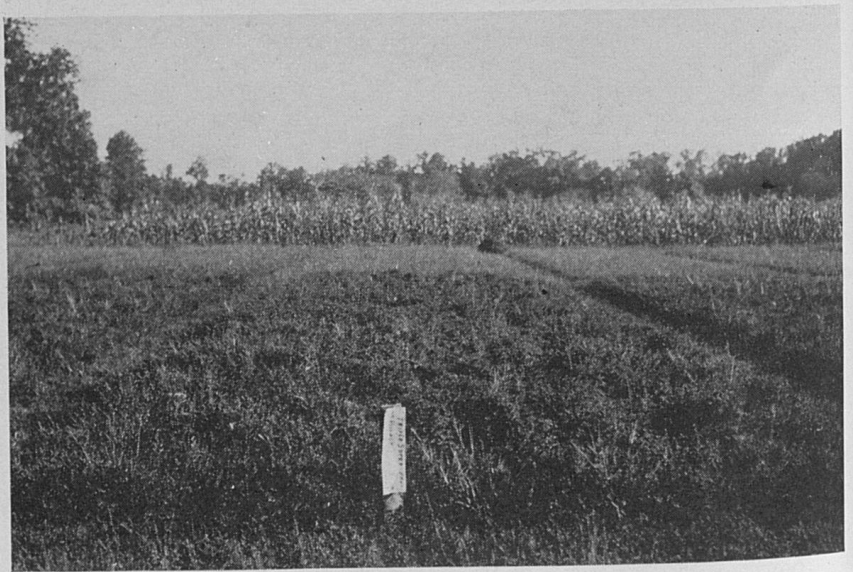
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A pasture of Korean lespedeza and orchard grass.



Effect of liming on lespedeza. The part in the foreground was limed; that at the back, next to the corn, was not.

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Circular No. 297

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The Lespedezas in Kentucky

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By E. J. KINNEY, RALPH KENNEY, and E. N. FERGUS

As closely as can be estimated, lespedeza, chiefly Korean, alone or in combination with grasses, occupied over 3,000,000 acres of land in Kentucky in 1935 and 1936, which is at least three times the total acreage occupied by all other legumes. Most of this immense acreage has been developed during the past 10 years and much the larger part within the past 5 years. Apparently there has been no decrease in the production of other legumes; hence the 3,000,000 acres of lespedeza represent a net gain of this amount in the legume acreage of the State.

Adaptability to a variety of soils which permits growing it with some degree of success on almost any soil, even if much depleted, and its usefulness as a pasture legume account largely for the predominant importance of lespedeza. Legumes are necessary in pastures if they are to provide the maximum amount of grazing and remain productive, and since Kentucky has over 7,000,000 acres in pastures, a good pasture legume is greatly needed. Lespedeza has met that need and has proved especially valuable on the somewhat acid and more or less unproductive soils comprising a large proportion of the pasture land of the State. It not only improves the pasture because of its soil-building quality, but it also provides a large amount of pasture itself after midsummer when pasture grasses are more or less dormant. Because of its ability to reseed itself, it persists almost indefinitely in permanent pastures on the less productive soils of the State and in closely grazed pastures on the more productive soils.

Korean and the other large-growing annual lespedezas are also valuable hay crops, especially where the soil is not sufficiently productive for red clover and alfalfa. On worn soil, hay can be produced successfully with a much smaller expenditure for soil-improving materials than is necessary for raising red clover or alfalfa. On fertile soil, clean stands of the annual lespedezas, when cut at the

proper stage, make hay almost if not quite equal in feeding value to clover hay for livestock; on poor soil the hay is less nutritious.

Just how lespedeza compares with red clover and other legumes for adding nitrogen to the soil, has not been fully determined. Indications are, however, that it compares favorably, especially if grown in connection with grasses or followed with a winter cover crop where grown alone, to prevent loss of nitrate.

A feature of lespedeza which has contributed much to its popularity is its dependability. It is better able to withstand the competition of nurse crops and weeds in the seedling stage during dry periods than clover or alfalfa; consequently losses of the stand occur much less frequently than with the latter. In fact, lespedeza seldom fails to make a stand regardless of seed bed and climatic conditions. Lespedeza seeds abundantly, especially the Korean; consequently the seed usually sells at a very moderate price. Cheap seed contributes greatly to the usefulness of a forage crop.

The ability of lespedeza to grow on soil too acid or too deficient in one or more of the mineral elements of plant food for the growth of clover and most other legumes, is only a temporary advantage. For some time lespedeza may continue to give fair returns and crops following may yield better than formerly because of the nitrogen added to the soil by the legume crop. Obviously, however, the supply of mineral nutrients will eventually become too limited even for the growth of lespedeza, particularly if the crop is removed and no manure returned. This should be understood and every effort should be made to supply the needed soil-improving materials before such a stage is reached.

#### SPECIES AND VARIETIES OF LESPEDEZA

The species and varieties of lespedeza cultivated in this country are all native of Eastern Asia. A number of species, all perennial, are native to North America, but apparently none of these is of agricultural value. Several grow wild in Kentucky, but are nowhere abundant, which indicates the lack of aggressiveness so characteristic of the introduced Asiatic forms. The latter comprise three distinct species, Common lespedeza (*Lespedeza striata*), generally known as Japan clover, Korean lespedeza (*Lespedeza stipulacea*) and the perennial lespedeza (*Lespedeza sericea*). Tennessee 76 and Kobe are giant varieties of Common, and Harbin is a dwarf variety of Korean.



*Common* lespedeza has been present in this country for nearly a century. It was first found growing wild in Georgia, in 1846. How it was introduced has never been determined. During the Civil War it became widely distributed over much of the South and possibly gained a foothold in Kentucky at that time or shortly after. It has been abundant on waste land, old pastures and along roadsides in most parts of the State for 40 years or more.

The species is not uniform but consists of numerous strains, particularly in its more southern range, which differ considerably in length of time required to produce seed and to a less extent in size of plants and habits of growth. The later strains ripen seed only in the South, but the earliest produce sufficient seed before frost to reproduce the stand as far North as Central Ohio, Indiana and Illinois; consequently the variation in seeding habits has permitted common lespedeza to become established over a wide range of latitude.

Kentucky farmers were slow to recognize the value of common lespedeza and it was not until about 15 years ago that any considerable amount of seed was sown. Interest developed rapidly, however, and soon it ranked as one of the most important legumes. At first most of the seed used was brought from the South but later much seed was produced locally. Common lespedeza is an excellent pasture legume and on productive soil often grows large enough to cut for hay. It is not so generally useful as Korean, however, and as soon as seed of the latter became plentiful practically all farmers stopped sowing the common. Doubtless the successful experience with common lespedeza in the State was largely responsible for the tremendous interest in Korean which resulted in such a very extensive use in so short a time following its introduction.

*Tennessee 76* is the progeny of an individual plant selected from common lespedeza at the Tennessee Experiment Station, in 1915. It grows much taller and more erect than common but closely resembles the latter in other visible characters.

*Tennessee 76* is as desirable for pasture as common and better for hay because it grows so much larger. Apparently it produces less seed than common or *Kobe*, the other variety of common. It is also later in maturing. It is very sparingly grown in Kentucky. Seed of *Tennessee 76* cannot be distinguished from seed of common lespedeza.

*Kobe lespedeza* was obtained in 1919 near Kobe, Japan; hence

the name. It was first grown and distributed by a commercial seed firm in South Carolina. This variety of common lespedeza is not easily distinguished from Tennessee 76 during growth, especially in a thick stand. In a thin stand Kobe, like the common, has a more spreading habit of growth than Tennessee 76, the plants are somewhat coarser and the leaflets broader. It ripens seed earlier and, according to growers who have grown seed of both commercially, is more productive of seed. The seeds of Kobe are much larger than those of common or of Tennessee 76 and can easily be distinguished. Because of the larger size of the seeds a heavier rate of seeding of Kobe is necessary than of other varieties in order to get an equally thick stand.

*Korean* lespedeza differs from the varieties of *L. striata* in many respects, and is easily distinguished from them. It grows about as large as Kobe, and the tips of the growing stems are more compact and distinctly different in appearance. In a very thin stand, the stems grow more or less prostrate and a single vigorous plant may form a cluster two feet or more in diameter. In a thick stand, however, few branches form and the plants grow erect. Seeding habits also differ from those of the common species and it is far more productive of seed. Korean lespedeza seed germinates in less time than seed of the common, and consequently the plants appear earlier in the spring. Its early growth is much more rapid than that of other varieties; hence it furnishes somewhat earlier grazing. The seed ripens about three weeks earlier than that of common or Kobe. All varieties of common drop their leaves when killed by frost, but the leaves of Korean are retained most of the winter.

*Harbin* matures much earlier than Korean and the plants are much smaller. It should not be sown in Kentucky.

*Lespedeza sericea* is a true perennial form. How long it will persist, doubtless depends much upon the way the crop is utilized. Dr. Pieters\* states that plants at the U. S. D. A. farm at Arlington, Virginia, from which a seed crop has been harvested each year for 10 years are still vigorous. It is doubtful if stands cut for hay or pastured will persist that long, however. *Sericea* winter-killed rather badly during the winter of 1932-33. This is the only winter in which injury has been reported. However, other winters have been relatively mild, except 1935-6, and in that instance there was ample snow protection when temperature was low.

\* Mimeographed material, United States Department of Agriculture, 1932.



*Sericea lespedeza* has not been grown long enough or utilized extensively enough to fully determine its usefulness. It seems to grow remarkably well on poor, acid soil, apparently even better than the annual varieties. It produces good yields of hay but feed-



A thick stand of *sericea lespedeza*.

ing tests have given conflicting results as regards its feeding value. Certainly it must be cut at an early stage of growth to be palatable. As a pasture crop, reports are conflicting as to its value, tho it has a high carrying capacity. Whether or not it will long withstand close grazing, has not been determined. At the Kentucky Experiment Station considerable difficulty has been experienced in getting a good stand in broadcast seedings with small grain. After the plants are up, they seem to be very drouth resistant, and are able to compete remarkably well with weeds.

*Sericea lespedeza* begins growth much later in the spring than alfalfa, the first shoots appearing about the latter part of April in the latitude of Lexington, Kentucky. At that time alfalfa may be a foot high. Growth is very rapid, however, and it may be ready to cut for hay almost as early as alfalfa. The stems of *Sericea* are rather coarse, especially in a thin stand, and they become hard and woody with age. To make palatable hay the crop must be cut at an early stage. The plants are very leafy and carefully cured hay carries a larger proportion of leaves than of stems. The composi-

tion of the hay varies according to the maturity of the crop when cut. Doubtless also the percentage of ash varies according to the mineral content of the soil upon which the hay is grown. Not enough analyses have been made as yet to give a very good idea of the average composition.

*Sericea lespedeza* was obtained from Japan in 1923, and small quantities of seed were distributed for trial a few years later. Regarding its introduction, Dr. Pieters\* states that at the time of its preliminary distribution it was believed to be new to the United States. The finding of a patch growing wild led to a study of old records and it was found that at least two previous introductions had been made, one by the North Carolina Experiment Station in 1896 and one by the U. S. D. A. in 1900. Apparently in the earlier trials it had not appeared promising and was not kept.

Referring to the different strains sent out, Dr. Pieters states that numbers 12087 and 17291 are apparently identical. No. 04730 matures seed a little earlier than 12087 and grows slightly taller.

#### **THE BEST LESPEDEZA FOR KENTUCKY\*\***

It is no accident that all but a small fraction of the lespedeza grown in Kentucky is Korean for it is undoubtedly the most generally useful variety for this State. While it does not differ significantly from other kinds of lespedeza in adaptation to soil and other conditions, it is far more productive of seed than any other variety, with the possible exception of *Sericea*, the value of which is yet to be determined. The importance of good seeding habits in a forage crop can scarcely be over emphasized. It assures an abundant supply of seed at a relatively low price which encourages its extensive use. Korean lespedeza is not only a heavy producer of seed, but it is also dependable. Except in rare instances the seed ripens in any part of the State early enough to escape frost injury, which is not true of other varieties, and even in very dry years such as 1930 and 1936, fair yields are obtained where soil conditions are favorable. The seed crop can be harvested more readily by machinery than that of other varieties, with less loss by shattering. It also ripens early enough to permit seeding a grain crop in the stubble.

There are possibly some conditions where Kobe, Tennessee 76 or even the common may prove more desirable than Korean. Kobe, in particular, has some enthusiastic advocates in southwestern Ken-

\* Mimeographed material, United States Department of Agriculture, 1932.

\*\* Unless otherwise indicated, the annual lespedezas are referred to.



tucky. Experiments so far conducted indicate that, with comparable stands, Kobe, Tennessee 76 and Korean give about the same average yields of hay. Presumably the total amount of pasturage furnished is also about the same. Korean furnishes earlier grazing while the other varieties remain palatable later in the fall. The latter feature is not of great importance where mixtures of grass and lespedeza are used, for the grass revives in the fall and provides late grazing. Korean lespedeza makes fair grazing even after the plants are killed by frost, because the leaves are retained. It would seem, therefore, that seeding costs, dependability in producing good stands and how well the crop reseeds itself should be the deciding factors in choosing a variety. Some experiments indicate that Korean is less tolerant of soil acidity than Kobe and other varieties and not so well adapted to worn land, but here again results are conflicting. It is an easy matter for any farmer to determine by actual test what variety or varieties best meet his requirements, and such a test is well worth making.

#### **LESPEDEZA FOR PASTURE**

The introduction of lespedeza into the agriculture of Kentucky has greatly simplified the problem of establishing and maintaining good pastures. Pastures composed of grasses alone soon become unproductive even on fertile soil, probably because nitrogen becomes locked up in unavailable forms. When legumes are grown in connection with grasses, they supply the nitrogen required by the latter. They also increase the total amount of pasturage, since they thrive when climatic conditions are unfavorable for the growth of grass. This is particularly true of lespedeza which is a hot-weather crop, and most vigorous in midsummer when grasses are naturally dormant. Not only does a grass-legume mixture give the most pasturage but it is also an excellent soil-building combination. A cheap and effective way to improve a worn field is to add the needed minerals, usually lime and phosphate, sow to a mixture of lespedeza and grasses and keep it in pasture for several years. There is an immense amount of land in Kentucky so unproductive that cultivated crops can not be grown profitably on it. Such land, if sown in lespedeza, would provide considerable pasture and its fertility would be increased. There are also many thin bluegrass pastures in the outer bluegrass region that would give almost twice the grazing they now give, by the addition of lespedeza.

It is seldom advisable to sow lespedeza alone for pasture because of the relatively short season of pasturage furnished. It grows rather slowly for some time and even Korean which is ready to graze two or three weeks earlier than other varieties, gives little



A pasture of Korean lespedeza and bluegrass. This should have been grazed closer.

pasturage before the latter part of May or first of June, in the latitude of Lexington. The plants are killed by the first heavy frost of fall. Grasses, on the other hand, furnish the most grazing in spring and fall so that the two crops complement each other. Furthermore, grasses make a turf which resists erosion and also prevents the leaching of nitrogen during the winter.

Since lespedeza reseeds itself in pastures, even when closely grazed, it may persist as long as the grasses. However, a very thick stand of bluegrass may crowd out lespedeza, or any other legume for that matter, if grazed very lightly. Conversely, if lespedeza is permitted to make a heavy growth during the summer, it may kill some of the bluegrass. Grazing may be so regulated, however, that neither the grass nor lespedeza suffers from competition. There is little or no danger of bunch grasses, particularly orchard grass, crowding out lespedeza nor will lespedeza smother out such grasses after they become established. There is some danger, however, that a very thick stand of lespedeza may kill young grass; consequently it is not advisable to seed the lespedeza too heavily when



establishing mixed pasture. If the grass is seeded the previous fall, it withstands better the competition of the lespedeza the first year. Fairly close grazing also tends to prevent the lespedeza from injuring the young grass.

On the Kentucky Experiment Station farm a 25-acre pasture of lespedeza and orchard grass was established 12 years ago. It is still productive and the two components are in about the same proportions as originally. On another field, a mixture of timothy, red clover, and Korean lespedeza was sown in 1933. This field has been cut for hay every year since. The stand of timothy is very thick, but considerable lespedeza has survived, indicating its ability to withstand severe competition.

#### **LESPEDAZA FOR HAY**

*Soil Requirements and Yields.* For successful hay production, lespedeza requires a fairly productive soil. However, fair yields may be obtained on less productive soils by using phosphate fertilizers, and very good yields from the use of both lime and phosphate. Fertile bottom lands are especially desirable for growing hay since they are less affected by summer drouth. Under favorable soil and productive conditions thick stands of lespedeza produce remarkable yields of hay. It is estimated that where the stand is good, a yield of a ton per acre may be expected when the height of the plants is 8 or 9 inches; two tons when 12 to 14 inches, and 4 tons when 2 feet high.

*Controlling Weeds in Hay Crops.* Weeds seldom give trouble the first year when lespedeza is seeded in small grain and, if moisture conditions are favorable, a good crop of clean hay may be obtained. In volunteer stands, however, or where the lespedeza is seeded alone, considerable weed growth often occurs. This does not ordinarily reduce the yield, but of course weedy hay is not desirable. Weeds can be controlled quite effectively by clipping the field once or twice during the season. The first clipping is usually done while the lespedeza is small — say about the middle of June. A second clipping if necessary may be made later. However, if the weeds are not very numerous, a second clipping is not advisable. *It is highly important to avoid cutting off the tops of the lespedeza plants in clipping,* since that greatly reduces the yield of hay or seed. If necessary a weedwheel should be used on the mower.

*When to Cut for Hay.* The best quality of hay is produced

when lespedeza is cut when in full bloom. A somewhat larger yield is obtained if cutting is deferred until seed is partially formed, but the hay is less palatable and less nutritious. It is advisable to cut lespedeza even before it blooms if much lodging occurs, for when the plants lodge the lower leaves "scald" and drop off, thus reducing the value of the hay. Scalding also tends to prevent the formation of new shoots after the hay crop is harvested. Korean lespedeza, if harvested at the blooming stage or earlier, usually produces new branches from the stems, which mature sufficient ripe seed for reseedling. This is one decided advantage of Korean for hay. It is believed that a crop which has not lodged will reseed itself in western Kentucky if cut in very early September.

Korean lespedeza produces its first blooms about the middle of August in Central Kentucky in normal seasons. If July is very dry, however, blooming is delayed. Kobe blooms about 2 to 3 weeks later; consequently, if the latter is cut in the full-bloom stage, it will not reseed itself. As a matter of fact, whether or not reseedling occurs is not of great importance in growing lespedeza hay, since the cost of seeding is usually not heavy.

*Curing the Hay.* Lespedeza cures quicker than any other legume hay, which is one important reason for its popularity. Hay cut in the morning can be stored safely the following day if conditions are favorable for curing. It may even be baled safely the second day, according to the statement of some growers. It is the only legume hay that can be baled from the windrow or swath, without much danger of damaging in the bale.

Like all legume hays, the best quality is obtained where most of the curing occurs in the windrow or cock. It scarcely pays to cock lespedeza, however, since it cures so quickly. The hay should be raked before the leaves become dry enough to shatter — usually 5 or 6 hours after cutting. Very good lespedeza hay may be made by curing in the swath but it should be raked early in the morning if very dry, to prevent loss of leaves.

Lespedeza should be cut for hay when about 15 to 18 inches high. If left much longer, the stems become woody and unpalatable. A 4- or 5-inch stubble should be left, as the new shoots come from the stem rather than from the crown. The second cutting usually has finer stems and is leafier than the first. Lespedeza should be raked before the leaves dry as they shatter very readily in handling.



### SEED PRODUCTION

Kentucky is one of the largest producers of Korean lespedeza seed. Small amounts of Kobe, common and sericea are also produced. As stated, Korean is extremely productive of seed and yields of 500 pounds an acre or more are not unusual under favorable conditions. The average yield in the State is about 200 pounds an acre. The best yields are usually obtained the second or third year after a field is seeded but in many instances fair yields of clean seed are obtained the first year. A moderately thick stand produces much more seed than a dense, thick stand, especially if the dense stand has lodged badly, as often happens.

Sericea lespedeza blooms late and the seed does not ripen until the middle of October or later; consequently early October frosts would reduce yields greatly. Some extraordinary seed yields of sericea have been reported in Kentucky — as much as 800 to 1000 pounds an acre where the crop was planted in rows and cultivated. No record of seed yields from broadcast stands are available.

The largest average yields of lespedeza seed are obtained on fertile, low-lying land and there is a natural tendency for production to become concentrated in such areas. The production of lespedeza seed or any other farm seed, for that matter, is a job for the specialist rather than for the general farmer; hence in the future, it is almost certain that most commercial seed will be grown by experienced men on a scale large enough to justify the purchase of machinery and other equipment necessary for handling the crop most economically and for producing the highest grade of seed.

*Harvesting the Seed Crop.* To an increasing extent the small combined harvester is being used for harvesting lespedeza seed. Unquestionably the crop can be harvested more cheaply with the combine than by any other method and less seed is lost by shattering. Probably the use of this machine will become general during the next few years in the important producing areas just as it has in the harvesting of soybean seed in the Corn Belt.

To reduce the loss from shattering, the Korean seed crop should be mowed and raked while damp from dew or rain. Many farmers do the work at night. A side-delivery rake causes less shattering than the sulky rake. A windrowing attachment fastened to the cutter bar of the mower is much used now in harvesting Korean seed. The attachment deposits the material in a neat windrow behind

the mower so it is not run over as mowing proceeds. Where plants are very short, the lespedeza, or fairway, cutter bar should be used. Often very fair yields of seed are obtained from Korean lespedeza so short that it cannot be cut with the ordinary cutter bar.

Common lespedeza seed is harvested by the use of seed pans attached to the cutter bar of the mower. These are made of metal in most instances, altho some home-made wooden pans are used. The top of the metal pan is covered with a perforated lid. As the crop is cut, a man following the mower pulls the mowed plants over the pan, and most of the seed shatters off into the pan. When the pan is full, the seed and accompanying chaff are scooped into bags and later recleaned. Mowers may be fitted with reels to drag the cut material across the pan and also aid in threshing out the seed. By using such reels one man can do the harvesting.

Kobe lespedeza and Tennessee 76 are generally handled like Korean — that is, cut and threshed. However, seed pans are also commonly used when the crop is mowed, in order to save the shattered seed, which may amount to a considerable percentage of the crop. The combine harvester should prove especially valuable for harvesting Kobe and Tennessee 76.

Sericea lespedeza for seed is likewise cut with a mower. Usually, men following with forks gather it into small piles which are placed so they will not be run over by the team and mower. A self-rake reaper would seem to be almost ideal for harvesting sericea. No doubt the sericea seed crop could be handled very successfully with combines.

*Threshing.* Usually Korean lespedeza is allowed to become dead ripe before harvesting for seed; consequently it may be threshed as soon as dry. However, after mowing and raking, Korean may be left in the field for several weeks with little loss. Korean lespedeza is threshed with an ordinary grain separator, usually provided with a recleaning attachment. It is difficult to separate certain weed seeds, particularly dodder, from hulled seeds, hence hulling should be avoided as much as possible in threshing. Usually the speed of the cylinder is reduced one-third or more, which must be accomplished without reducing the speed of the rest of the machinery. Generally only one concave is used, unless the material is very tough. What is known as an orchard grass seed screen is placed below the riddles. The air must be so adjusted as to clean the seed properly but without waste. With the recleaning attachment in



use, good threshers produce seed of 95 to 98 percent purity. Capacity varies with the size of the machine. Under favorable conditions, 5000 to 8000 pounds of seed may be threshed in a day's run with a large separator.

Most threshermen in Kentucky have had much experience in threshing lespedeza and understand the proper adjustments for successful threshing. Small lots of seed for home use can be flailed out without much trouble. Corn shredders may also be used. *Sericea lespedeza* may be threshed with either a grain separator or a clover huller.

*Recleaning the Seed.* Most of the commercial seed crop is cleaned in plants where modern power-driven cleaners are in use, with experienced operators in charge. These plants do an excellent job of cleaning and, if a considerable amount of seed is to be recleaned, particularly if it contains dodder, it is best to have the work done by a reliable custom cleaner. Much seed is sold to dealers and seedsmen without recleaning. The buyers estimate the loss and pay accordingly. Naturally, they usually make liberal estimates, and it is therefore more profitable to have the seed recleaned before selling.

A fairly satisfactory job of cleaning can be done on a good hand fanning mill if the proper screens are used. A slotted top screen or "scalper" with perforations just wide enough to let the lespedeza seed pass thru removes the larger weed seeds, such as ragweed. The lower screen, or sieve, should have round perforations which permit anything smaller than a lespedeza seed to pass thru. This takes out dodder and other small weed seeds. For Korean seed, a screen with round perforations  $\frac{1}{16}$  inch in diameter is generally used. Sometimes, however, perforations  $\frac{1}{15}$  inch in diameter are necessary to remove dodder. For Kobe, the perforations should be somewhat larger, and for *sericea*, smaller. Good work cannot be done if the seed is fed on to the screens too rapidly. Furthermore, the lower screen must be cleaned out frequently, as it becomes clogged. It may be necessary to run the seed thru the fanning mill several times before the desired purity is attained.

Dodder seed cannot be thoroly cleaned out of lespedeza without also taking out much of the hulled seed. It is very important, therefore, to avoid hulling the seed in threshing. *Sericea* seed should be hulled and scarified before sowing. If growers cannot

do this or have it done, it is best to sell to dealers rather than to sell direct to farmers.

#### HARD SEEDS

As is true of most legume seeds, lespedeza seeds cannot germinate for some time after ripening. This is because the seed coats are too hard or dense for water to penetrate. If it were not for this period of enforced dormancy, natural reseeding could not occur. The seeds would germinate soon after they fell to the ground and the young plants would winter-kill. There is much variation in the length of time required for the seed coats to become permeable or "soft." A small percentage becomes soft in a few weeks and since Korean seed ripens early, these soft seed may germinate in the fall. By February about 90 percent of the seeds are capable of germinating, according to tests conducted by the Kentucky Experiment Station Seed Laboratory.

After the dormant stage is past, Korean lespedeza seed germinates very quickly and where the crop has reseeded itself or where seed has been sown early, a short period of warm weather in February or early March — a frequent occurrence in Kentucky — may bring the plants up. Usually these early stands are killed later by freezes or heavy frosts. However, it is seldom that a good stand of Korean lespedeza is not produced by self-seeding. Korean reseeds itself very heavily and enough of the seeds remain hard until well along in the spring, to give a thick stand. In addition, considerable seed is retained on the old plants thruout the winter and early spring, most of which drops in late March and early April. In many instances the amount is sufficient to give a good stand if all other seed is lost. The seeds of other varieties of lespedeza require more time to germinate and usually the plants do not come up early enough to be injured by frost.

#### GERMINATION OF LESPEDEZA SEED AT DIFFERENT AGES

Some early tests at the Louisiana Experiment Station indicated that seed of common lespedeza more than one year old is not safe to use. The germination of two-year-old seed was very low, and three-year-old seed gave no germination at all. At the Illinois Experiment Station, six-year-old common lespedeza seed showed a germination of about 80 percent.

The Kentucky Experiment Station seed laboratory collected sam-



ples of lespedeza seed in the fall of 1933. Part of the seed was stored in a dry basement room and part in the seed laboratory. Germination tests in duplicate were made in July of 1934, 1935 and 1936, and will be continued as long as any germination is obtained. Results to date are as follows:

**Viability of Lespedeza Seed Kept Under Different Conditions**

Variety and time elapsed after gathering	In basement		In laboratory	
	Germination	Hard seed	Germination	Hard seed
	Percent	Percent	Percent	Percent
<b>Common</b>				
9 months .....	88	5	80	9
21 " .....	75	10	72	8
33 " .....	25	8	51	9
<b>Korean</b>				
9 months .....	81	11	83	13
21 " .....	85	9	81	12
33 " .....	65	7	82	6
<b>Sericea</b>				
9 months .....	76	14	76	14
21 " .....	85	8	84	11
33 " .....	66	8	74	9

It will be noted that the germination of common lespedeza seed fell off greatly the third year when kept in the basement, but much less when kept in the drier atmosphere of the seed laboratory. The germination of Korean and Kobe stored in the basement also decreased somewhat the third year, but practically not at all when stored in the seed laboratory. Obviously, the longevity of common lespedeza is less than that of Korean or sericea. It is obvious also, as is generally recognized, that conditions under which seed is stored affect longevity. This experiment indicates that it is safe to sow two-year-old seed of any of the lespedezas that has been stored in a reasonably dry place, but it is not very safe to sow three-year-old seed.

**SEEDING PRACTICES**

*Time of Seeding.* Perhaps a majority of experienced growers in Kentucky prefer to sow Korean lespedeza during the latter part of March or early in April. Equally good stands are obtained, usually, as from earlier seedings and there is little danger of killing frosts occurring after the plants are up. However, many growers think that early seeding is more desirable despite occasional injury from freezing. The stand becomes established earlier and the plants are better able to withstand competition of the nurse crop and weeds or later dry weather. If the seeds become well covered,

a few days of warm weather are not so likely to bring about germination as when they are on the surface. In all early seeding, alternate freezing and thawing and rains must be depended upon to cover the seeds since it is seldom possible to stir the ground; hence, a better covering is usually obtained by seeding in early February or even late January, than by seeding in late February or early March. In other words, it would seem to be safer to sow very early or to wait until after the middle of March rather than to sow moderately early. The most certain method of getting seed well covered in early seeding is to sow on a "honeycomb" freeze. It is never advisable to sow on muddy ground. The condition of the seed bed should be taken into consideration in determining whether to sow early or relatively late. On old pastures or on trashy land where the ground cannot be stirred, early seeding is advisable. In sowing with small grain it is perhaps safer to sow late and run over the field with the harrow or rotary hoe or to use a clover-seed drill. However, if the growth of grain is fairly rank, it is not of much advantage to stir the ground. On hard, bare land, the use of a harrow or other implement is always advantageous. In sowing with oats or alone on a prepared seed bed, it is better to sow the seed on the surface and allow rains to do the covering. After the middle of April moisture conditions are usually less favorable and it becomes increasingly difficult to get a stand. Because of slower germination, early seeding of all other varieties of lespedeza is advisable.

Korean lespedeza seed, if well cleaned, can be sown thru the grass-seeding attachment on the grain drill or with a clover-seed drill. Kobe and common, however, do not feed readily thru the drill, since the seeds are rather light and fluffy. Rotary hand seeders or wheelbarrow seeders are satisfactory for all varieties.

*Rate of Seeding.* For maximum yield the first year, 20 to 25 pounds per acre of Korean lespedeza seed should be sown, and about one-third more of Kobe. Good stands are often obtained with much lighter seedings, but the use of the larger amount is generally profitable. Three to five pounds an acre or even less will give a stand thick enough to provide a full stand the following year by volunteer seeding even if the first year's crop is pastured. In mixtures with grasses and other legumes, it is not advisable to sow more than 5 pounds an acre or the growth the first year may be so heavy as to injure the young grass. This is not likely to occur, how-



ever, if the grasses are fall sown, as they get well established before the lespedeza has made much growth, and are better able to withstand competition. Likewise if the lespedeza is pastured closely grasses will not be injured. On worn land a heavy rate of seeding is advisable, especially where the land has not been plowed for several years. On thin pastures, 6 to 8 pounds an acre is a desirable rate.

### INOCULATION

Doubtless the lespedeza nodule-forming organism is now present in most Kentucky soils, particularly in the western part of the State. However, unless it is known certainly that either lespedeza or cowpeas, which are inoculated by the same strain of bacteria, occupied the land previously, it is always advisable to introduce the organism artificially. This is most conveniently accomplished by inoculating the seed with a commercial culture or with the soil known to contain the proper organism. Directions for using commercial cultures are always printed on the containers and these directions should be followed faithfully. To inoculate with soil, the seed should be spread out and moistened slightly. Then the soil which should be first screened, is sprinkled over the seed using about a quart to each bushel of seed. It is necessary to shovel the seed over several times to get an even distribution of the soil. After inoculation the seed must be spread out and allowed to practically dry before sowing, so it will pass thru the seeder readily.

Treating the seed with both soil and a commercial culture gives greater assurance of good inoculation than the use of either one alone and this practice is recommended. Treatment with the commercial cultures moistens the seed sufficiently for soil treatment, which is carried out as where soil alone is used. The cost of inoculating with commercial cultures varies from 15 to 20 cents an acre depending upon the rate of seeding. Either lespedeza or cowpea cultures may be used. Soil for inoculating should be obtained if possible from a field that produced the previous year a crop of lespedeza or cowpeas with well nodule roots. On strongly acid soil or soil low in organic matter, it is advisable to inoculate the seed if several years have elapsed since cowpeas or lespedeza were grown. It has been found that the bacteria do not live in the soil very long under such soil conditions.

Lespedeza does not grow satisfactorily even on very fertile soil

unless inoculated and of course only soil nitrogen is used by uninoculated plants. In numerous instances considerable difficulty has been experienced in getting good inoculation with Korean lespedeza when sown on land for the first time and it has been suggested that perhaps Korean requires a different strain of bacteria. This has not been proved, however.

The great importance of inoculation is shown by an experiment conducted by the Illinois Experiment Station and reported in Illinois Bulletin 416. On limed land inoculated Korean lespedeza made 2260 pounds of hay an acre, as compared with 681 pounds where the lespedeza was not inoculated. On unlimed land, the yield of the inoculated plots was at the rate of 1,007 pounds an acre and that of plots not inoculated only 218 pounds an acre. It was also found at the Illinois Station that the nodulation on Korean lespedeza is markedly affected by liming. A high percentage of the plants gave good nodulation on acid soil only after limestone was applied.

#### ENEMIES OF LESPEDEZA

*Diseases and Insects.* All the lespedezas seem to be relatively free of disease in Kentucky; at least any injury that may have occurred was not sufficient to attract attention. The same thing is true of insect attacks. Grasshoppers and other leaf-eating insects feed on the plants to some extent, but no serious damage has been reported.

*Weeds.* Dodder is by far the most serious pest of lespedeza. The appearance and habits of this parasitic plant are so well known that any description is unnecessary. It gives little or no trouble in lespedeza pastures. In fact, close grazing is the most practical method of eradication. In fields intended for hay or seed, however, dodder is very troublesome and can be controlled only by burning out or destroying in some other way. If infestation is severe, the field should be pastured as it is impractical to attempt control under such conditions. However, if dodder-free seed is sown, severe infestation seldom occurs in a new seeding. Responsible seed growers of today, especially growers of certified seed, go over their fields methodically at frequent intervals from early summer until the seed is ripe and burn out every patch of dodder found. Where this is done and the seed carefully cleaned with properly equipped cleaning machinery, practically dodder-free seed can be produced. However, even the most modern cleaning machinery does not re-



move all dodder if much is present. For the production of hay only the best quality of seed should be sown and the same system of field control should be followed as practiced by seed growers; otherwise fields may become so heavily infested with dodder seed that they can no longer be used for growing lespedeza hay.

Many methods of destroying dodder in the field are used. Some growers scrape off all vegetation in the infested area and pile it in the middle of the scraped area to dry so it may be burned. This is very laborious. Others spread straw over infested areas and burn. Gasoline or kerosene torches are used to some extent. The method most widely used at the present time and undoubtedly the most practical, is to sprinkle the infested patches with a mixture of about one part gasoline to 5 parts spent crank-case or crude oil and burn. Kerosene to which a very small amount of gasoline has been added may also be used. On hot, sunny days the mixture vaporizes rapidly after applying, and one must be careful when lighting it or he may be burned.

Other weeds are most troublesome when the stand of lespedeza is thin. Ragweed and buttonweed are usually the most abundant but numerous other species occur. Clipping is an effective means of control (see page 11).

**WHAT TO SOW WITH LESPEDEZA**

*Pasture Mixtures.* As previously stated, lespedeza seldom should be sown alone for pasture. All our common grasses can be used to advantage with it and the following mixtures are offered as suggestions:

Orchard grass ....	12 pounds	}	Generally useful outside the Bluegrass region where considerable permanence is desired. Useful in the Bluegrass region for semi-permanent pastures.
Lespedeza .....	5 "		
Redtop .....	2 "		
Timothy .....	8 "	}	A cheap temporary pasture; sow the timothy in the fall, if possible.
Lespedeza .....	6 "		
Redtop .....	5 "	}	For wet land. Sow redtop in the fall, if possible.
Lespedeza .....	5 "		
Bluegrass .....	15 "	}	A good mixture for the Bluegrass region. Bluegrass should be fall sown.
Lespedeza .....	5 "		

*Hay Mixtures.* Because of the relatively late maturity of lespedeza, it is usually best to grow it alone for hay. Some nitrogen

will be lost from the soil, by leaching during winter and spring, but there seems no practical way to avoid this. Possibly a cover crop or rye or other grain might be sown and utilized for pasture. If grazed heavily it would probably not interfere much with the growth of the lespedeza after the first of June and any remaining could be clipped off after heading out. Another suggestion is to sow Fulghum or other variety of rustproof oats. These varieties of oats stand temperatures as low as 10° to 12°F. but usually kill completely during the winter. However, they would probably prevent most leaching of nitrates.

If July and August rainfall is good, lespedeza, especially Korean, sown with grasses makes a good yield of hay following the harvest of the grass crop. It is a profitable practice to include a few pounds of lespedeza when seeding land to grasses or to a mixture of clover and grasses. If the growth of clover is rank, it may smother the lespedeza, but grasses alone seldom do.

#### LESPEDEZA IN THE ROTATION

Lepedeza, whether grown for hay, seed or pasture, fits well into almost any cropping system. In regions where topography necessitates keeping land in pasture much of the time, or wherever the animal industry is important, cultivated crops should be followed with small grain which may either be harvested or utilized for pasture. If a bluegrass pasture is to be established, the seed should be sown with the grain in the fall and lespedeza sown in the spring. By sowing timothy with the bluegrass, a hay crop may be produced the next year. Then the field may be used for pasture as long as desired. Outside of the bluegrass regions, orchard grass may be substituted for bluegrass and timothy. Generally it pays to sow a few pounds of redtop also. Orchard grass makes good hay if cut when in bloom.

In sections where more intensive cropping is followed, the following rotation may prove practical:

First year — Corn or tobacco followed by small grain.

Second year — Small grain crop in which lespedeza is sown. The lespedeza may be utilized for hay or seed or it may be pastured.

Third year — Lespedeza for hay or seed. Small grain sown on stubble in fall and grass sown.

Fourth year — Small grain; lespedeza and grass pastured.



Fifth year — Lespedeza-grass pasture. The field may be kept in pasture for several years if desired.

This rotation may be modified in various ways, as, for example:

1. First year — corn or tobacco. Second year, wheat seeded to lespedeza and grass. Third and fourth year, lespedeza and grass.

2. First year corn or tobacco. Second year wheat seeded to lespedeza. Third year oats seeded in the lespedeza stubble. Fourth year lespedeza. Sowing a small grain in disked lespedeza stubble has been widely practiced in Kentucky for many years. This practice is economical because it requires a minimum of labor and the lespedeza reseeds itself.

**EXPERIMENTAL RESULTS AT THE KENTUCKY  
EXPERIMENT STATION**

The Experiment Station has obtained hay yields of Korean, Kobe and common lespedezas in comparative plot tests, in various parts of the State, since 1927 (except 1929 and 1936). *Sericea lespedeza* was included in the tests beginning in 1933. The average yields of barn hay, calculated to an acre basis, were as follows: Korean, 3349 pounds; Kobe, 3994 pounds; and common, 2825 pounds. Tennessee 76 produced approximately 92 percent as much hay as Korean in the few tests in which both were included. *Sericea* produced almost exactly twice as much hay as Korean from two- and three-year-old stands, in the tests which included both kinds. First-year yields of *sericea* hay are extremely variable and only indicate that the crop yields from practically nothing in the year of seeding to as much as Korean, or more, depending apparently upon the conditions at the time of seeding and upon the degree of inoculation obtained.

Twenty-six samples of high-grade Kentucky grown Korean lespedeza hay of the 1934 and 1935 crops had the following average composition, according to analyses made by the Feed Control Department of the Kentucky Agricultural Experiment Station: 11.8 percent protein, 3.7 percent fat, 42.9 percent nitrogen-free extract, 27.0 percent crude fiber, 4.5 percent ash, and 10.1 percent water. The percent of phosphorus was 0.17. The few analyses made of other kinds of lespedezas, including *sericea*, indicate that they have approximately the same composition as Korean if degree of maturity and soil productivity are comparable.



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