Experiments With Annual Lespedeza

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Summary

The Virginia Agricultural Experiment Station has conducted a study of the potential of annual lespedeza for forage production. The study was prompted by requests stating the belief that the yields of annual lespedeza had declined in recent years and that investigation might reveal the cause.

Lespedeza yields have, in fact, remained essentially unchanged over the last 33 years. For the 1931-1963 period they averaged 1.02 tons per acre. Experiment station yields run 50 to 100% higher and represent the potential of the crop under good fertility and management with present varieties. Primarily because of its shallow root system, the crop does not possess the yield potential of alfalfa or red clover.

In recent experiments the biggest single factor necessary for the best yields was ample and well-distributed soil moisture, especially in June, July, and August. The crop responded to lime, phosphorus, and potassium but not to applied nitrogen. Commercial inoculants failed to increase yields, and there were no major insect or disease problems encountered. Under high fertility and favorable moisture conditions, weeds grew vigorously and were severely competitive.

Lespedeza Acreage Declining

Annual lespedeza has been a forage and pasture crop of considerable

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1/ The following were responsible for conducting the experiments: R. D. Sears, Southside Virginia Research Station, Charlotte Courthouse; G. D. Jones, Piedmont Research Station, Orange; M. T. Carter, Virginia State College Research Station, Petersburg.
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2/ Assistant Professors of Agronomy, and Professor of Agronomy, respectively.

importance in Virginia since its introduction about 1930. Acreage decreased from 564,000 acres in 1945 to 237,000 acres in 1961. This decrease has been partially replaced by other legumes, mainly alfalfa and red clover, which have higher yield potential. Although total acreage will probably continue downward, lespedeza will continue to be of value in certain areas of the State, especially the southern Piedmont and eastern sections, where it has attained its greatest popularity.

Although lespedeza has the ability to grow on infertile and acid soils, it does respond to soil improvement. Lespedeza hay is credited with being 80 to 85% as effective as alfalfa for beef and milk production.* It is also used in permanent and temporary pastures for summer and early-fall grazing.

Yields Unchanged

While yields of lespedeza have fluctuated over the years, there has been no definite trend in yields either upward or downward. State yields in the 1931-1939, 1940-1949, and 1950-1959 periods averaged 0.99, 1.06, and 1.00 tons per acre, respectively.

There is a strong relationship between yield and soil moisture for the critical growing period of June, July, and August. Lespedeza is a shallow-rooted plant; plentiful moisture is essential to good growth. Poorly distributed or inadequate rainfall, as well as thin stands, may also contribute to low yields. Table 1 shows the average per-acre yields made by Virginia farmers for the years 1931 through 1963, and the combined June, July, and August rainfall for the same years. While average yields varied little over the 33-year period, individual farmers have experienced yields considerably above or below the average, depending upon favorableness of growing conditions.

Table 2 shows Experiment Station yields of recommended varieties at 3 locations in recent years and summer rainfall at each location in each year.

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* Ahlgren, Gilbert H. 1956. Forage Crops, Second Edition. McGraw-Hill, New York.

These yields are 50 to 100% higher than average, and represent potential of the crop under relatively good fertility and management, exclusive of weather hazards. Compared with top yields of lespedeza of about 2 tons per acre, recommended alfalfa varieties at the same location in these years yielded more than 5 tons per acre.

Varieties and Variety Testing

Testing in Virginia has been limited because of the lack of new strains and varieties. Table 3 compares the yields of Rowan and Summit, 2 of the more extensively tested new varieties, with commercial Korean and commercial Kobe, the standard varieties in widespread use. Korean yield was given a value of 100, and the relative yields of Kobe, Rowan, and Summit were 98, 102, and 113, respectively. Climax and Auburn Korean were other varieties tested at some locations in recent years. Climax, a selection released by U.S.D.A. in 1944, produced yields equal to or slightly higher than Korean. It matures about 2 weeks later than commercial Korean. Auburn Korean is an early maturing type. In Virginia tests it produced slightly less than the commercial Korean variety.

Rowan variety is a strain of Korean lespedeza released by the North Carolina Experiment Station and U.S.D.A. in 1952. It has shown resistance to the 2 most common forms of root knot nematodes and to powdery mildew. It is especially recommended in Virginia for soils infested with root knot, and has produced average yields on nematode-free soils.

Summit is a new, high-yielding, disease-resistant variety of Korean lespedeza. It was released jointly by the Arkansas and Missouri experiment stations and U.S.D.A. in 1962. It produced from 30 to 80% more forage and from 60 to 80% more seed per acre than Korean in Arkansas tests. Increased yields of Summit are mainly attributed to its resistance to 2 important

lespedeza diseases, bacterial wilt and tar spot, which cause rapid defoiliation during extended periods of warm, humid weather.

Recent Experiments with Lespedeza in Virginia

1958

Lespedeza yields were measured on Cecil fine sandy loam in an experiment where several pH levels had been established. The soil had a dilute acid-soluble phosphorus (0.002 normal H_2SO_4) content of 32 lbs. per acre and 0.38 me. per 100 grams of exchangeable potassium. Yield increases were obtained up through pH 6.8, as shown in Table 4.

1961

An experiment involving both lime and fertilizer was conducted on a moderately eroded, infertile, unlimed area of Cecil fine sandy loam at Charlotte Courthouse in 1961. The soil tested pH 5.2, 1.2% organic matter, phosphorus low, and potassium medium, at the Soil Testing Laboratory at Blacksburg. There were 3 rates of fertilization, 0, 500, and 1,000 lbs. per acre of 0-30-15. Yield results are shown in Table 5. Significant yield increases resulted from the use of both lime and fertilizer, and the highest yield occurred where the highest rate of each was used.

Another experiment in 1961, 1962, and 1963 tested the effect of supplemental irrigation on annual lespedeza yield. Results are shown in Table 6. Modest yield increases were obtained in 1961 and 1962, and a tremendous increase resulted in 1963. In 1961 the high summer rainfall, (17.92") was poorly distributed, with more than 10" occurring in June and less than 1.5" in July. In 1963 there was extreme deficiency in summer rainfall -- the total June, July, August rainfall was slightly more than 3", compared to a normal 12" to 15".

A third experiment was conducted with lespedeza on Cecil fine sandy

loam at Charlotte Courthouse in 1961 and 1962. It was related to the effects of commercial inoculant. No significant yield differences resulted from the use of commercial inoculation. Actual yields are not shown in this report.

1962

An experiment with lime and fertilizer treatments was conducted on a severely eroded, infertile, unlimed area of Madison fine sandy loam in 1962. The soil tested pH 5.2, organic matter 1.6%, phosphorus low, and potassium medium, at the Soil Testing Laboratory. A total of 13.64" of rainfall was recorded for June, July, and August. Table 7 shows the yields obtained. Significant responses to both lime and fertilizer were obtained and, as in 1961, the highest rates of lime and fertilizer produced the highest yields.

No yield response to applied nitrogen was obtained in either 1961 or 1962 (Table 8).

1963

The summer was unusually dry and no harvestable yields were obtained from a lime-fertility experiment on Cecil fine sandy loam. As in former years, adequate moisture was a critical factor for satisfactory lespedeza production.

Table 1. Average yields of annual lespedeza in Virginia for 1931-1963, and the total June, July, August rainfall for the same years.*

Year	Average lespedeza yield	Total June, July, August rainfall
	tons per acre	inches
1931	1.00	15.32
1932	0.80	8.17
1933	1.05	13.52
1934	0.95	13.03
1935	1.05	12.63
1936	0.70	11.28
1937	1.20	17.52
1938	1.10	16.21
1939	1.05	16.35
1940	1.10	18.07
1941	1.00	13.93
1942	1.15	18.33
1943	0.90	10.75
1944	0.95	9.48
1945	1.10	15.44
1946	1.15	12.01
1947	0.95	11.96
1948	1.20	14.32
1949	1.15	16.43
1950	1.10	12.66
1951	1.05	13.25
1952	1.10	13.02
1953	0.75	9.29
1954	0.80	9.64
1955	1.10	17.11
1956	1.00	14.82
1957	0.80	9.12
1958	1.20	16.91
1959	1.10	14.60
1960	1.10	11.29
1961	1.20	15.36
1962	1.15	11.95
1963	0.70	7.62

* From Virginia Farm Statistics, Bulletin 17, Virginia Department of Agriculture, and Bureau of Agricultural Economics, United States Department of Agriculture.

Table 2. Average annual yields of recommended varieties of lespedeza at 3 experiment station locations, and summer rainfall for the years reported.

Year	Yield lespedeza hay, 12% moisture	Rainfall			
		June	July	August	Total
	tons per acre	inches			
	Piedmont Research Station, Orange, Virginia.				
1956	1.23	2.54	5.97	3.32	11.83
1961	2.24	2.26	5.75	6.91	14.92
1962	1.23	3.26	3.56	3.44	10.26
	Southside Research Station, Charlotte Courthouse, Virginia.				
1957	0.98	2.70	3.95	6.43	13.08
1958	1.64	5.06	1.77	5.34	12.17
1959	1.55	1.89	4.83	2.50	9.22
1960	1.99	1.32	3.41	4.97	9.70
1961	1.57	10.39	1.16	6.37	17.92
1962	1.97	7.14	4.44	2.06	13.64
	Virginia State College Research Station, Petersburg, Virginia.				
1956	1.97	3.28	10.32	2.28	15.88
1957	0.65	3.92	1.80	7.46	13.18
1958	1.90	6.09	3.27	9.77	19.13
1961	1.86	6.49	2.85	3.90	13.24
1962	2.27	5.57	5.65	2.37	13.59

Table 3. Forage yield [1/] summary of annual lespedeza varieties at 3 locations in Virginia, 1961-64.

Variety	Petersburg				Orange			Charlotte C.H.			Avg.[2/]	Relative yield[3/]
	1961	1962	1964	Avg.	1961	1962	Avg.	1961	1962	Avg.		
	tons per acre				tons per acre			tons per acre				
Rowan	1.91	2.41	1.89	2.07	2.13	1.68	1.90	1.42	0.88	1.15	1.76	102
Kobe (Commercial seed)	1.88	2.03	2.02	1.98	1.98	1.33	1.65	1.60	0.95	1.27	1.68	98
Korean (Commercial seed)	1.81	2.26	1.88	1.98	2.03	1.71	1.87	1.50	0.88	1.19	1.72	100
Summit	1.84	2.37	1.91	2.04	2.82	1.76	2.29	1.76	1.21	1.48	1.95	113

1/ 12% moisture.

2/ Average yield of recommended varieties, 1.78 tons per acre (Korean, Kobe, Rowan and Summit).

3/ Yields of Korean were used as checks and assigned the relative value of 100.

Table 4. Annual lespedeza yields at different lime levels on Cecil fine sandy loam in 1958 at Charlotte Courthouse.

Rate of lime applied in 1954	Soil pH in 1958	Lespedeza hay, 12% moisture
tons per acre		lbs. per acre
0	5.5	2,407
1	6.0	2,851
2	6.6	3,243
4	6.8	3,304
8	7.0	3,154

Table 5. Effect of lime and fertilizer on the yield of annual lespedeza at Charlotte Courthouse in 1961 on Cecil fine sandy loam.

Rate of lime	Lespedeza hay yields, 12% moisture			
	Fertilizer and rate per acre			
	0	500 lbs. 0-30-15	1,000 lbs. 0-30-15	Average
tons per acre	lbs.per acre	lbs. per acre	lbs. per acre	lbs. per acre
0	1,469	1,704	2,100	1,757
3	2,173	2,525	2,528	2,408
6	2,142	2,495	3,085	2,574
Average	1,928	2,241	2,571	

Table 6. Effect of supplemental irrigation on annual lespedeza yield at Charlotte Courthouse on Cecil fine sandy loam.

Treatment	Pounds lespedeza hay per acre, 12% moisture
1961	
Not irrigated	3,180
Irrigated	4,170
Rainfall for June, July, August in 1961 = 17.92" **	
1962	
Not irrigated	4,324
Irrigated	4,835
Rainfall for June, July, August in 1962 = 13.64"	
1963	
Not irrigated	258 *
Irrigated	3,220
Rainfall for June, July, August in 1963 = 3.14"	

* Based on the only stand tall enough to obtain a harvestable yield.

** 10.39" in June, 1.16" in July, and 6.37" in August.

Table 7. Effect of lime and fertilizer on the yield of annual lespedeza at Charlotte Courthouse in 1962 on Madison fine sandy loam.

Rate of lime tons per acre	Lespedeza hay yield, pounds per acre, 12% moisture Fertilizer and rate per acre 0	500 lbs. of 0-30-15	1,000 lbs. of 0-3-15	Ave.
0	370	958	1,525	951
3	753	1,365	1,849	1,322
6	1,186	1,675	1,870	1,577
Average	769	1,332	1,748	

Table 8. Yields of Kobe and Korean lespedeza at Charlotte Courthouse in 1961 and 1962 when treated and untreated with nitrogen.

Variety	Treatment	Pounds per acre of lespedeza hay, 12% moisture		
		1961	1962	Average
Korean	0 nitrogen	3,750	1,550	2,650
Korean	50 lbs per acre nitrogen	4,100	1,420	2,760
Kobe	0 nitrogen	4,590	1,990	3,290
Kobe	50 lbs per acre nitrogen	4,700	1,860	3,280