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The 1998 Kura Clover Report

N.L. Taylor, R. Spitaleri, J.C. Henning, G.D. Lacefield, D.C. Ditsch, and R.E. Mundell

Introduction

Kura clover (*Trifolium ambiguum*) is a recently introduced high quality, long-lived perennial legume that is used in mixed stands, primarily for pasture and soil improvement. This species spreads by rhizomes and has the ability to fill in bare spaces, thus causing stands to thicken. It was introduced from the Caucasus region of the former U.S.S.R. and is very winter hardy. It is well adapted to the humid northeastern and north central regions of the United States and less well adapted to the southern United States. It is often difficult to establish because of low seedling vigor but once established lives indefinitely, mostly by virtue of an extensive root system that often exceeds the dry weight of the top of the plant.

Kura clover blooms only once per season and only after being induced by low temperatures encountered in winter. It apparently is very disease and insect resistant. Seeds of a number of varieties are becoming available, but supplies remain short. This report provides current yield and stand data on varieties of kura clover that may be tried in Kentucky on an experimental basis.

Sowing the Varieties

Due to low seedling vigor, varieties of kura clover should be sown on bare soil after incorporation of a herbicide such as Balan to control weeds (See *Weed Control in Alfalfa and Other Forage Legume Crops* (AGR-148) and *Kura Clover for Kentucky* (AGR-141). Kura clover seeds must be inoculated with a special *Rhizobium* inoculant (Trifolium Spec 3). Sow seeds at 10 to 12 pounds per acre without grasses (higher rates may be recommended for difficult sites such as strip mine spoils). Contact the authors for seed sources of varieties.

Description of the Test

A three-year study was conducted on Spindletop Farm at Lexington on a Maury silt loam to compare dry matter yield and stand maintenance of kura varieties with alfalfa and ladino clover. The only variety currently released in the United States is Rhizo (released cooperatively by the Natural Resources Conservation Service and the University of Kentucky). It was compared in this study with several other experimental and foreign introduced kura varieties (Table 1). Because seed coating containing the *Rhizobium* inoculum is recommended in New Zealand and Australia, seed-coating treatments were evaluated. Seeds were coated by Seedbiotics, St. Joseph, Missouri. The coating included the *Rhizobium* inoculant, gum arabic (sticker), and a lime carrier. Seeds of the noncoated kura varieties were inoculated with the same inoculant. Seeds of Alfagraze alfalfa and ladino clover were inoculated (not coated) with a commercial inoculant designated especially for alfalfa and clover (different from the kura inoculant). The study was sown May 23, 1995. Plots were 5 x 15 feet, arranged in a randomized complete block design with four replications. Seeds were sown at 12 pounds per acre using a disk drill on a prepared seedbed that had Balan herbicide previously incorporated. The kura clover was harvested with a sickle-type forage plot harvester with the blade set at a 2½- to 3-inch height. Four harvests were made in 1996, four in 1997, and three in 1998. Generally, harvests were made at five-week intervals. Fresh weight samples were taken at each harvest to calculate percent dry matter production. Fertilization was according to University of Kentucky Cooperative Extension Service recommendations. Weeds were controlled with recommended herbicides to provide weed-free forage for the yield tests. Stands were estimated visually and recorded yearly.

Table 1. Source of kura clover varieties (and check species).

Variety/Species	Proprietor/Distribution
Rhizo	Natural Resources Conservation Service and the University of Kentucky. Released jointly to Peterson Seeds Inc. and Norfarm Seeds Inc., Bemidji, Minnesota
Endura	Wrightson Seeds Ltd., Christ Church, New Zealand
KZ-2	Wrightson Seeds Ltd., Christ Church, New Zealand
Cossack	Geertson Seed Company, Adrian, Oregon
Early Selection	University of Kentucky breeding line
NF-93	Experimental, Norfarm Seed Inc., Bemidji, Minnesota
Ladino Clover	Olds Seed Company., Madison, Wisconsin
Alfagraze	Agripro Seed Inc., Nampa, Indiana.

Results and Discussion

Weather data for Lexington (1995-1998) are presented in Table 2. Generally, 1995 was warm in March and April and very wet in May, which led to optimum establishment of the test (sown May 23). In 1996, temperature and rainfall were near normal, whereas in 1997 temperatures were low except in February, and

Table 2. Temperature and rainfall at Lexington 1995-1998.

	1995				1996				1997				1998			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
Month	°F	Dep[a]	Inches	Dep	°F	Dep	Inches	Dep	°F	Dep	Inches	Dep	°F	Dep	Inches	Dep
Jan	34	+3	3.75	+0.89	31	0	4.38	+1.52	31	0	2.94	+0.08	41	+10	3.96	+1.10
Feb	34	-1	1.65	-1.56	36	+1	1.50	-1.71	41	+6	2.62	-0.59	41	+6	2.54	-0.67
Mar	48	+4	2.85	-1.55	39	-5	4.44	+0.04	46	+2	13.06	+8.66	46	+2	3.40	-1.00
Apr	56	+1	3.39	-0.49	51	-4	5.15	+1.27	49	-6	1.40	-2.48	54	-1	6.20	+2.32
May	63	-3	9.75	+5.28	66	+2	8.23	+3.76	58	-6	6.14	+1.67	67	+3	6.14	+1.67
Jun	72	0	4.75	+1.09	72	0	3.45	-0.21	70	-2	6.20	+2.54	73	+1	10.81	+7.15
Jul	72	+2	3.32	-1.68	73	-3	4.80	-0.20	75	-1	3.32	-1.68	75	-1	7.98	+2.98
Aug	79	+6	4.61	+0.68	74	-1	3.13	-0.80	72	-3	3.02	-0.91	76	+1	0.29	-3.64
Sept	66	0	2.68	-0.55	66	-2	5.11	+1.91	66	-2	1.47	-1.73	74	+6	0.61	-2.59
Oct	56	0	3.99	+1.42	57	0	1.39	-1.18	56	-1	1.92	-0.65	58	+1	2.41	-0.16
			40.74				41.58				45.03				44.34	

[a]Dep is departure from the long-term average.

rainfall was in excess (especially in March) and was deficient from July on. In 1998, temperatures were generally higher than normal, and rainfall was in excess early in the year but in deficit later. The late drought reduced the number of kura harvests to only three during 1998.

Yield data (on a dry matter basis) and percent stand data are presented in Tables 3 through 5. Yields are given by cutting date and as total annual production. Varieties are in order from highest to lowest total production (based on total yield for the life of the test).

Statistical analyses were performed on all kura varieties (including alfalfa and ladino clover checks) to determine if the apparent differences were truly due to variety. Varieties not significantly different from the top variety within a column are marked with an asterisk (*). To determine if two varieties are truly different, compare the difference between the two varieties with the least significant difference (LSD) at the bottom of the column. If the difference is equal to or greater than the LSD, the varieties are truly different under the conditions of the present location. The coefficient of variation (CV), which is a measure of the variability of the data, is included for each column of means. Low variability is desirable, and increased variability within the test results in higher CVs and larger LSDs.

A visual estimate of percent ground cover in the case of kura clover reflects primarily the variety's seedling vigor, but for other species—alfalfa and white clover—it reflects the variety's persistence as well. In general, all varieties of kura were very persistent at Lexington.

Excellent stands were obtained in 1995 by all species and varieties in the test, and complete ground cover was achieved. Four harvests were made in 1996 (Table 3), and yields of most varieties of kura were equal to that of the alfalfa check variety. However, the Rhizo variety, the early selection, and ladino were lower yielding than the alfalfa check.

Four harvests of forage were also made in 1997 (Table 4). Total yields were somewhat less than in 1996 due to lower yields of the July, August, and September harvests. However, rainfall in 1997 was greater than in 1996, so the reason for the lower yield is not known. Percent ground cover of Alfagraze was higher than most kura varieties. Dry matter yield followed the same trend. Ladino clover stands disappeared but volunteered later so that the stand was replenished.

Table 3. Dry matter (tons/acre) of kura clover varieties in 1996, sown May 23, 1995.

	1996 harvests				
Variety	May 24	July 1	Aug 8	Sept 9	Total
Alfagraze	1.69	0.99*	1.03*	0.98*	4.69*
Endura-n	2.31*	1.06*	0.54	0.74	4.64*
KZ-2-c	2.24*	0.97*	0.53	0.84*	4.58*
Endura-c	1.93*	1.07*	0.54	0.93*	4.48*
Cossack-n	2.08*	1.01*	0.52	0.79	4.40*
KZ-2-n	2.19*	0.99*	0.43	0.74	4.34*
NF-93	1.98*	0.94*	0.54	0.87*	4.32*
Cossack-c	1.92	0.96*	0.58	0.85*	4.30*
Rhizo-c	1.65	0.80	0.34	0.67	3.45
Rhizo-n	1.22	0.72	0.44	0.86*	3.23
Ladino	1.28	0.84	0.47	0.62	3.20
Early Selection	1.37	0.66	0.27	0.67	2.97
Mean	1.82	0.91	0.52	0.80	4.05
CV%	14.20	11.30	19.41	15.43	9.09
LSD 0.05	0.37	0.15	0.15	0.18	0.53

*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.
n = no seed coating, c = seed coating. Differences between coated and noncoated were not significant at the 0.05 level.

In 1998, only three harvests were made due to late summer drought (Table 5). The highest yielding kuras were Endura and Cossack, which were not significantly different from Alfagraze. Kura stands were still very thick except for the experimental early selection.

Total yield over the three years of the test is summarized in the right-hand column of Table 5. Coated seed was approximately equal to uncoated seed. None of the kura clover varieties equaled alfalfa, but a few were close. Rhizo was among the lower yielding of the kura clover varieties. These data suggest

that kura clover is well adapted to Kentucky conditions and may be a valuable perennial component of pasture for livestock grazing. Further variety testing is needed over a wide range of Kentucky soils and conditions.

Summary

Kura clover promises to be a major forage legume for pastures in Kentucky and other cool, humid areas of the United States. This test indicates that kura clover has a similar yield potential as alfalfa and is more persistent than white clover. Unfortunately, seed of only one variety (Rhizo) is available, and seed of this variety is in short supply and high priced. Growers willing to try this legume should contact the authors for sources of seed and detailed instructions on establishment.

Authors

N.L. Taylor, Professor, Clover Breeding, UK Agronomy
R. Spitaleri, Research Specialist, Forages, UK Agronomy
J.C. Henning, Extension Professor, Forages, UK Agronomy
G.D. Lacefield, Extension Professor, Forages, UK Agronomy
D.C. Ditsch, Extension Associate Professor, Feed Production, UK Agronomy
R.E. Mundell, Research Analyst, Clover Breeding, UK Agronomy

Table 4. Dry matter (tons/acre) and stand ratings of kura clover varieties in 1997, sown May 23, 1995.

Variety	% Ground Cover May 17	1997 harvests June	July	Aug	Sept	Total
Alfagraze	91.3*	1.97*	0.46*	0.53*	0.46*	3.42*
Endura-c	75.0	1.52	0.55*	0.62*	0.20	2.89*
NF-93	87.5	1.60*	0.44*	0.55*	0.23	2.83
Cossack-c	80.0	1.56	0.43	0.56*	0.27	2.82
Cossack-n	82.5	1.51	0.39	0.54*	0.33	2.78
Rhizo-n	78.8	1.55	0.42	0.45	0.22	2.64
KZ-2-c	82.5	1.47	0.43	0.53*	0.24	2.64
Endura-n	78.8	1.20	0.47*	0.58*	0.16	2.41
Rhizo-c	71.3	1.19	0.34	0.43	0.18	2.13
KZ-2-n	67.5	1.07	0.35	0.38	0.24	2.05
Early Selection	65.0	1.04	0.33	0.43	0.23	2.03
Ladino Clover	0.0	0.55	0.16	0.26	0.29	1.26
Mean	71.7	1.35	0.40	0.49	0.25	2.49
CV%	10.78	19.18	20.67	21.31	24.79	15.39
LSD 0.05	11.12	0.37	0.12	0.15	0.09	0.55

*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.
n = no seed coating, c = seed coating. Differences between coated and noncoated were not significant at the 0.05 level.

Table 5. Dry matter (tons/acre) and stand ratings in 1998 of kura clover varieties, sown May 23, 1995.

Variety	% Ground Cover July 28	1998 harvests May	June	July	Year Total	3-Year Total
Alfagraze	86.3*	1.17*	0.92*	1.08*	3.17*	11.28*
Endura-c	90.8*	1.27*	0.66*	0.80	2.72*	10.10
Cossack-c	82.5*	1.26*	0.60	0.94*	2.81*	9.93
Endura-n	87.3*	1.33*	0.57	0.86*	2.75*	9.80
KZ-2-c	81.3*	1.20	0.56	0.84	2.60	9.80
NF-93	82.5*	1.21*	0.54	0.79	2.53	9.69
Cossack-n	80.0*	1.16*	0.53	0.82	2.51	9.68
KZ-2-n	82.5*	1.17*	0.54	0.85	2.56	8.96
Rhizo-n	70.0*	1.14*	0.61	0.75	2.51	8.38
Rhizo-c	78.8*	1.67*	0.59	0.69	2.45	8.04
Early Selection	58.8	1.06*	0.48	0.63	2.18	7.18
Ladino Clover	53.8	0.84	0.76	0.67	2.26	6.74
Mean	77.9	1.16	0.62	0.81	2.59	9.13
CV	14.68	15.79	22.79	13.33	12.61	9.04
LSD 0.05	16.44	0.26	0.20	0.17	0.47	1.19

*Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.
n = no seed coating, c = seed coating. Differences between coated and noncoated were not significant at the 0.05 level.

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