

# 1992 Kentucky Red Clover Variety Test Report

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## Introduction

Red clover is a high quality, short-lived, perennial legume that is used in mixed or pure stands for pasture, hay, silage, green chop and soil improvement. This species is adapted to a wide range of climatic and soil conditions and therefore is very versatile as a forage crop. Stands are generally productive for two or three years with the highest yields occurring in the year following establishment. Red clover is used primarily as a renovation legume for grass pastures. It is a dominant forage legume in Kentucky because it is relatively easy to establish and has high forage quality, yield, and animal acceptance.

Yield and persistence of red clover varieties are dependent on environment and pressure from diseases and insects. The most common red clover diseases in Kentucky are southern anthracnose, powdery mildew, sclerotinia crown rot and root rots. High yields and persistence (as measured by ground cover) are two indications that a red clover variety is resistant to or tolerant of these diseases when grown in Kentucky.

This report provides current yield data on red clover varieties included in yield trials in Kentucky as well as guidelines for selecting red clover varieties. Five studies are included in this report. Three are part of the Kentucky Forage Variety Testing Program with the remainder being part of the Kentucky Red Clover Breeding Program.

## Description of the Tests

**Breeding Program Tests:** These studies were planted at Lexington in 1991 and 1992 with a corrugated roller in 3 x 13 feet plots arranged in a randomized complete block design with four replications using 14 pounds of seed per acre. An oat companion crop was sown concurrently. The seedbed was a lightly disked small grain cover crop that had been planted the previous fall. Harvests were taken at 10-25% bloom using a flail-type forage plot harvester with the whole plot collected and oven dried.

Breeding Program Tests include experimental red clover lines from Kentucky and other states that may become certified varieties in the future. In addition, these plots contain some commercially available lines for comparison.

**Variety Performance Tests:** Red clover variety tests were established at Lexington (1991 & 1992) and Princeton (1991). The Variety Performance Tests include several commercial certified varieties (presently marketed or that will be marketed in the near future) and selected "common" red clovers. Altaswede, a mammoth or "single-cut" red clover developed in Canada, and Regal ladino white clover were included for comparison. Common red clover, generally sold as "medium red clover variety unknown," is uncertified red clover with an unknown performance record.

Plots were 4 x 15 feet and were arranged in a randomized complete block

design with four replications. Seedings were made at 16 pounds (2 lb for white clover) of seed per acre into a prepared seedbed using a disk drill (no oat companion crop). Plots were harvested with a sickle-type forage plot harvester. First cuttings in the seedling year were delayed to allow the red clover to completely reach maturity as indicated by full bloom, which generally occurs about 60-90 days after seeding. Otherwise, harvests were taken when the red clover was in the bud to early-flower stage. Fresh weights were measured in the field and occasional subsamples were taken and weighed and oven dried and reweighed to determine percent dry matter.

The soils at both locations were well-drained silt loams (Maury at Lexington and Crider at Princeton) and well-suited to red clover production. Management of all tests was according to University of Kentucky Cooperative Extension recommendations.

### Results and Discussion

Weather data for Lexington and Princeton are presented in Table 1. A freeze in early April occurred across the state. Otherwise, temperatures at Lexington were below normal throughout the growing season while precipitation was above normal and at Princeton, temperatures were above normal for most of the growing season but precipitation was below normal from April to June and above normal from July to September. At both locations, September was exceptionally cool and precipitation was well below normal in October.

Yield data (on an oven dry basis) and percent stand for all tests are presented in Tables 2-6. Statistical analyses were performed on all red clover data to determine if the apparent differences are truly due to variety or just due to chance. The highest yielding variety in each column is marked with two asterisks (\*\*). Those varieties not significantly different from the highest yielding variety are marked with one asterisk (\*). To determine if two varieties are truly different, compare the difference between the two varieties to the Least Significant Difference (L.S.D.) at the bottom of the column. If the difference is equal to or greater than the L.S.D., the varieties are truly different when grown under the conditions at a given location. The Coefficient of Variation (C.V.), 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 a study results in higher C.V.'s and larger L.S.D.'s.

Percent stand, a visual estimate of ground cover, reflects the cultivar's seedling vigor, ability to compete with weeds, resistance to disease, and stand persistence. In general, the highest yielding varieties in any test were also the most persistent as determined by percent stand.

In spite of the April freeze, which frosted back top growth, five cuttings were made from each established Variety Test while four harvests were taken from the established Breeding Test. Yields of the 1992 Breeding Test were measured only once since the first cutting had a large component of oats. Due to the cool September and dry October regrowth after the September harvests for all tests was not measurable and so no post-freezedown cuttings were made.

**Variety Performance Tests:** Altaswede and the common red clovers were among the lowest yielding entries in the Variety Performance Tests (Tables 2-4).

These results are not unexpected for Altaswede, which naturally does not produce much regrowth after the first cutting. However, the differences between the common entries and most of the other certified varieties was large for both yield and percent stand. Total 2-year yields of common red clovers were 1.02 to 2.75 tons/A less than Kenstar in Lexington and 1.20 to 1.94 tons/A less in Princeton. Percent stand of the common lines was roughly half of that of Kenstar at the end of the second production year at these locations.

**Breeding Tests:** In general, varieties that performed well in the Variety Performance Tests also did well in the studies of the UK Breeding Program. In these tests, the poor performing varieties generally were either not adapted to Kentucky (the Florida varieties FL-5, FL-MTC, and FL6-EF) or are experimental lines under evaluation. The experimentals, though locally adapted, are still undergoing selection for better characteristics and so these varieties should not necessarily be expected to perform well compared to cultivars currently being marketed in Kentucky. Table 7 summarizes information about proprietors, distributors and yield performance across years and locations for all the varieties currently included in tests discussed in this report. In Table 7, shaded areas indicate that the variety was not in that particular test (labelled at the top of the column) while clear blocks mean that the variety was in the test. Some varieties, such as Acclaim, Kenstar, and Marathon, have been sown in every test; others, however, such as Cherokee, Fus, and Redman, have been included in only one test. A double Asterisk (\*\*) indicates that the variety was the highest yielding variety in the test for that year. A single asterisk (\*) means that the variety was not significantly different from the highest yielding variety.

#### Variety Selection

The first step in selecting a red clover variety is to consult published variety information such as this report because good performance over several years and locations is the best indication that a variety is adapted to Kentucky and resistant to the common diseases of red clover. In addition, the best variety will exhibit good stand persistence.

Select a certified variety of red clover that is consistently high yielding over as many years and at as many locations as possible. This information is indicated by the presence of asterisks in Table 7. The proper way to interpret this table is to look for a locally available variety that has as many asterisks as possible. While this may discriminate against varieties that have only recently been included in test plots, this selection criteria gives the greatest probability that the variety chosen will do well under future conditions.

Make sure seed of the variety will be available when needed and is properly labelled. The seed should have high germination, a current test date (within the previous nine months) and relatively few crop and weed seeds. Certified seed of improved varieties may be more expensive than common red clovers but will yield significantly more and have better stand persistence. Look for the blue tag that is required on all bags of certified seed.

#### Summary

Proper management, beginning with land preparation and continuing throughout the life of the stand, is necessary for even the highest yielding, most pest-resistant variety to be productive. Maintaining soil fertility at recommended levels based on soil tests and controlling weeds are a must. Harvesting at the appropriate stage of maturity will produce 3 cuttings in the seeding year and four to five cuttings every year thereafter before mid-September in Kentucky. Other College of Agriculture publications related to the establishment, management and harvesting of red clover available from the local county extension office are listed in Table 8.

TABLE 1. TEMPERATURE AND RAINFALL IN LEXINGTON  
AND PRINCETON DURING 1992.

MONTH	LEXINGTON				PRINCETON			
	TEMPERATURE		RAINFALL		TEMPERATURE		RAINFALL	
	F	DEP.	INCHES	DEP.	F	DEP.	INCHES	DEP.
JAN	35.4	1.0	3.63	0.06	38.6	4.3	1.95	-2.58
FEB	41.4	3.2	1.95	-1.31	46.3	8.0	3.16	-0.75
MAR	45.8	-1.4	4.85	0.02	49.7	2.5	5.94	0.89
APR	58.4	-0.1	2.11	-1.90	61.5	3.0	1.57	-3.04
MAY	62.0	-4.5	4.68	0.45	64.7	-1.9	3.37	-0.88
JUN	71.8	-2.7	7.72	3.47	74.7	0.1	3.13	-0.25
JUL	76.0	-2.1	10.29	5.34	79.1	1.0	7.27	3.37
AUG	76.1	-0.8	4.72	0.76	78.2	1.3	6.79	3.19
SEP	65.4	-5.1	3.54	0.26	66.7	-3.8	4.51	1.21
OCT	60.0	1.0	0.65	-1.61	62.2	3.2	1.96	-0.49

TEMPERATURES ARE IN DEGREES FAHRENHEIT.

DEP. IS DEPARTURE FROM THE 30-YEAR AVERAGE FOR THAT LOCATION.

TABLE 2. DRY MATTER YIELDS (TONS/ACRE) AND PERCENT STAND RATINGS OF RED CLOVER VARIETIES SOWN 11 APR 1991 AT LEXINGTON, KENTUCKY.

VARIETY	1991	1992 HARVESTS					1992	2-YR	STAND
	TOTAL	MAY15	JUN16	JUL14	AUG13	SEP17	TOTAL	TOTAL	NOV16
RENEGADE	3.63**	2.12	1.25**	1.00*	0.56*	0.57*	5.50*	9.13**	80.00*
VS638	3.28*	2.52**	1.10*	1.12*	0.48*	0.62*	5.85**	9.12*	93.75**
KENSTAR-II-SYN-I	2.94*	2.19	1.20*	1.00*	0.65**	0.65**	5.68*	8.62*	93.75**
MARATHON	2.99*	2.36*	0.99	1.13**	0.54*	0.62*	5.64*	8.62*	90.00*
CINNAMON	3.00*	2.33*	1.06	0.93*	0.62*	0.52*	5.46*	8.46*	88.75*
KENSTAR	3.13*	2.12	1.19*	0.92*	0.46*	0.60*	5.29*	8.42*	83.75*
CONCORDE	2.89*	2.20	1.09*	1.05*	0.59*	0.53*	5.46*	8.36*	85.00*
ARLINGTON	2.94*	2.15	1.06	1.10*	0.48*	0.60*	5.39*	8.33*	88.75*
ACCLAIM	2.49	2.29*	1.05	1.06*	0.63*	0.64*	5.67*	8.16*	93.75**
KENLAND	2.71	2.11	1.13*	0.61	0.60*	0.40	4.85	7.56	51.25
COMMON-D	2.69	2.06	1.04	0.69	0.53*	0.40	4.71	7.40	40.00
COMMON-C	2.82	1.97	1.01	0.59	0.48*	0.41	4.45	7.28	53.75
COMMON-B	2.50	1.86	0.79	0.59	0.50*	0.35	4.10	6.60	36.25
ALTASWEDE	2.08	1.79	0.74	0.39	0.38	0.31	3.61	5.69	7.50
COMMON-A	1.81	1.83	1.00	0.27	0.43	0.33	3.86	5.67	17.50
MEAN	2.79	2.13	1.05	0.83	0.53	0.50	5.04	7.83	66.92
C.V., %	19.74	10.39	11.50	25.54	26.97	19.37	10.99	10.99	27.53
L.S.D., 0.05	0.79	0.32	0.17	0.30	0.20	0.14	0.79	1.23	26.29

1991 TOTAL INCLUDES 4 HARVESTS DATED JUN27, JUL31, SEP03, AND OCT31.

\*\*HIGHEST YIELDING VARIETY IN THE COLUMN.

\* NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST YIELDING VARIETY.

TABLE 3. DRY MATTER YIELDS (TONS/ACRE) OF RED  
AND WHITE CLOVER VARIETIES SOWN 17 APR 1992  
AT LEXINGTON, KENTUCKY.

VARIETY	JUL08	AUG13	SEP17	1992 TOTAL
CINNAMON	1.76*	1.16**	0.75*	3.68**
FUS	1.90**	0.83	0.75*	3.48*
KENSTAR	1.55*	1.07*	0.83*	3.45*
MARATHON	1.60*	1.00*	0.76*	3.36*
VIRUS-RESISTANT	1.63*	0.96*	0.75*	3.34*
KENSTAR-II-SYN-I	1.63*	0.89	0.81*	3.33*
ACCLAIM	1.67*	0.84	0.66	3.17*
ARLINGTON	1.61*	0.84	0.72	3.16*
KENLAND	1.37	0.93*	0.86**	3.15
WVPB-RC-L	1.57*	0.84	0.72	3.13
ALTASWEDE	1.59*	1.03*	0.44	3.06
REGAL-LADINO	1.63*	0.68	0.72	3.03
COMMON-E	1.86*	0.75	0.35	2.96
COMMON-F	1.52*	0.62	0.56	2.71
MEAN	1.64	0.89	0.69	3.22
C.V., %	20.01	20.70	14.52	11.44
L.S.D., 0.05	0.47	0.26	0.14	0.53

\*\*HIGHEST YIELDING VARIETY IN THE COLUMN.

\* NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST YIELDING VARIETY.

**TABLE 4. DRY MATTER YIELDS (TONS/ACRE) AND PERCENT STAND RATINGS OF RED CLOVER VARIETIES SOWN 23 APR 1991 AT PRINCETON, KENTUCKY.**

VARIETY	1991	1992 HARVESTS					1992	2-YR	STAND
	TOTAL	MAY14	JUN18	JUL16	AUG12	SEP10	TOTAL	TOTAL	NOV19
CINNAMON	1.66*	2.12*	1.69**	0.86**	0.47*	0.42*	5.55**	7.21**	82.50*
CONCORDE	1.98*	2.18**	1.42	0.83*	0.45*	0.31	5.21*	7.19*	76.25*
KENSTAR-II-SYN-I	1.78*	2.06*	1.46	0.84*	0.47*	0.45**	5.27*	7.06*	88.75**
WVPB-RC-T	2.08*	2.09*	1.46	0.71*	0.41*	0.27	4.94*	7.02*	78.75*
RENEGADE	2.14**	1.82	1.60*	0.69	0.33	0.30	4.74	6.88*	70.00*
KENSTAR	1.85*	1.84*	1.54*	0.78*	0.48**	0.35*	4.99*	6.83*	80.00*
VS638	1.70*	2.14*	1.47	0.71*	0.43*	0.37*	5.11*	6.81*	87.50*
WVPB-RC-L	1.61*	2.05*	1.58*	0.71*	0.40*	0.31	5.05*	6.66*	75.00*
ACCLAIM	1.28	2.05*	1.58*	0.73*	0.41*	0.28	5.05*	6.33*	80.00*
MARATHON	1.43	1.86*	1.22	0.65	0.36	0.23	4.30	5.73	53.33
COMMON-B	1.55*	1.64	1.39	0.47	0.37	0.18	4.06	5.61	10.00
ARLINGTON	1.40	1.61	1.21	0.47	0.32	0.20	3.80	5.20	41.25
COMMON-C	1.29	1.60	1.31	0.35	0.28	0.15	3.70	4.99	10.00
COMMON-A	1.07	1.55	1.35	0.48	0.29	0.21	3.88	4.95	5.00
COMMON-D	0.87	1.77	1.31	0.43	0.32	0.18	4.01	4.89	13.75
KENLAND	0.99	1.70	1.37	0.47	0.20	0.15	3.89	4.88	68.33*
ALTASWEDE	0.64	1.58	1.07	0.34	0.22	0.17	3.39	4.02	21.25
MEAN	1.49	1.87	1.42	0.62	0.36	0.27	4.54	6.03	55.55
C.V., %	31.62	10.21	9.56	19.23	21.67	28.07	9.77	13.10	27.49
L.S.D., 0.05	0.67	0.27	0.19	0.17	0.11	0.11	0.63	1.13	21.76

1991 TOTAL INCLUDES 2 HARVESTS DATED JUL10 AND AUG14.

\*\*HIGHEST YIELDING VARIETY IN THE COLUMN.

\* NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST YIELDING VARIETY.



TABLE 5. PERCENT STAND RATINGS AND DRY MATTER YIELDS (TONS/ACRE) OF RED CLOVER SOWN ON 1 APR 1991 AT LEXINGTON, KENTUCKY, AS PART OF THE UK RED CLOVER BREEDING PROGRAM.

VARIETY	PERCENT STAND		1992 HARVESTS				1992
	JUN18	JUN26	MAY21	JUN29	AUG03	SEP17	TOTAL
REDDY	61.25*	48.75	1.73**	1.38*	0.71*	0.81**	4.62**
KENSTAR	62.00*	57.00*	1.62*	1.45**	0.78**	0.73*	4.59*
WVPB-RC-L	58.75*	50.00	1.68*	1.37*	0.68*	0.68*	4.41*
RENEGADE	56.25*	42.50	1.65*	1.34*	0.70*	0.70*	4.38*
KENLAND	65.00**	65.00**	1.61*	1.34*	0.73*	0.70*	4.38*
WVPB-RC-T	65.00**	57.50*	1.57*	1.41*	0.60	0.75*	4.33*
CONCORDE	55.00*	50.00	1.62*	1.21	0.77*	0.70*	4.30*
ACCLAIM	48.75	43.75	1.71*	1.26*	0.65	0.64*	4.27*
VIRUS RESISTANT	41.25	41.25	1.56*	1.13	0.66	0.80*	4.15*
VS638	60.00*	50.00	1.56*	1.25	0.60	0.69*	4.10*
RED STAR	62.50*	55.00*	1.64*	1.14	0.66	0.65*	4.09*
RAM	56.25*	51.25	1.66*	1.13	0.72*	0.53	4.04
ATLAS	45.00	37.50	1.64*	1.20	0.58	0.59*	4.00
MARATHON	46.25	43.75	1.57*	0.99	0.72*	0.71*	3.99
ROOT ROT SELECTION	61.67*	55.00*	1.37	1.02	0.73*	0.75*	3.86
N20 TETRAPLOID	25.00	16.25	1.54*	0.96	0.54	0.47	3.52
FL5	25.00	17.50	1.35	0.97	0.60	0.59*	3.50
FL-MTC	23.75	12.50	1.07	0.80	0.55	0.36	2.78
FL6-EF	10.00	7.50	1.26	0.72	0.45	0.23	2.67
MULTI-COTYLEDON	3.00	4.75	0.63	0.69	0.51	0.05	1.89
MEAN	46.59	40.36	1.51	1.14	0.65	0.61	3.90
C.V., %	17.75	22.05	16.81	12.60	12.77	29.30	10.53
L.S.D., 0.05	11.71	12.60	0.36	0.20	0.12	0.25	0.58

YIELDS NOT MEASURED IN 1991.

\*\*HIGHEST YIELDING VARIETY IN THE COLUMN.

\* NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST YIELDING VARIETY.

TABLE 6. PERCENT STAND RATINGS AND DRY MATTER YIELDS (TONS/ACRE) OF RED CLOVER SOWN ON 17 APR 1992 AT LEXINGTON, KENTUCKY, AS PART OF THE UK RED CLOVER BREEDING PROGRAM.

<u>VARIETY</u>	<u>AUG24 STAND</u>	<u>SEP21 YIELD</u>
CHEROKEE	70.00*	1.42**
KENSTAR	71.25*	1.40*
WVPB-RC-L	65.00*	1.40*
RENEGADE	60.00*	1.39*
ARLINGTON	60.00*	1.37*
REDMAN	67.50*	1.31*
RED STAR	78.75**	1.30*
KENLAND	78.75**	1.27*
MARATHON	58.75	1.27*
WVPB-RC-T	63.75*	1.26*
ACCLAIM	72.50*	1.25*
U.G. TETRAPLOID	50.00	1.25*
CONCORDE	70.00*	1.23*
VIRUS RESISTANT	36.25	1.19
4X-2X TETRA	22.50	1.18
N2O TETRAPLOID	28.75	1.11
REDDY	57.50	1.07
ATLAS	56.25	1.04
TRISTAN	43.75	0.97
PERSIST	38.75	0.90
MEAN	57.50	1.23
C.V., %	23.18	12.48
L.S.D., 0.05	18.88	0.23

\*\*HIGHEST YIELDING VARIETY IN THE COLUMN.

\* NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST YIELDING VARIETY.

**Table 7. Characterization and performance across years and locations of red and white clover varieties**

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			Lexington					Princeton	
			1991 <sup>1,2</sup>		1992 <sup>2</sup>	1991 <sup>3</sup>	1992 <sup>3</sup>	1991 <sup>2</sup>	
Variety	Proprietor	Kentucky Distributor	91 <sup>4</sup>	92	92	92	92	91	92
4x - 2x Tetraploid	KY Agric. Exp. Sta.	Experimental <sup>5</sup>							
Acclaim	Allied Seed Coop.	Scott Seed		*	*	*	*		*
Altaswede	Farmer ecotype, Canada	Public							
Arlington	WI Agric. Exp. Sta.	Public	*	*	*		*		
Atlas	Northrup King	Northrup King							
Cherokee	Florida Agric. Exp. Sta.	Public					**		
Cinnamon	FFR	Southern States	*	*	**			*	**
Common A	Farmer ecotype, Canada	Public							
Common B	Farmer ecotype, Minnesota	Public						*	
Common C	Farmer ecotype, Canada	Public							
Common D	Farmer ecotype, Canada	Public							
Common E	Farmer ecotype, Canada	Public							
Common F	Farmer ecotype, South Dakota	Public							
Concorde	ABI	ABI	*	*		*	*	*	*
FL5	FL Agric. Exp. Sta.	Experimental							
FL-MTC	FL Agric. Exp. Sta.	Experimental							
FL6-EF	FL Agric. Exp. Sta.	Experimental							
Fus	International Seeds	Experimental			*				
Kenland	KY Agric. Exp. Sta.	Public				*	*		
Kenstar	KY Agric. Exp. Sta.	Public	*	*	*	*	*	*	*
Kenstar II Syn I	KY Agric. Exp. Sta.	Experimental		*	*			*	*
Marathon	WI Agric. Exp. Sta.	Public	*	*	*		*		
Multiple Cotyledon	KY Agric. Exp. Sta.	Experimental							
N <sub>2</sub> O Tetraploid	KY Agric. Exp. Sta.	Experimental							
Persist	Northrup King	Northrup King							
Ram	ABI	ABI							

Reddy	FFR	Southern States				**			
Redman	FFR	Southern States					*		
Red Star	Vista Seeds					*	*		
Regal ladino clover	Auburn Univ. Agric. Exp. Sta.	Public							
Renegade	International Seeds	Green Seed	**	*		*	*	**	
Root Rot Selection	KY Agric. Exp. Sta.	Experimental							
Tristan	Northrup King	Northrup King							
U.G. Tetraploid	KY Agric. Exp. Sta.	Experimental					*		
Virus Resistant	KY Agric. Exp. Sta.	Experimental			*	*			
VS638	Scott Seed	Experimental	*	**		*		*	*
WVPB-RC-L	Olsen-Fennell Seeds	Experimental				*	*	*	*
WVPB-RC-T	Willamette Valley	Experimental				*	*	*	*


<sup>1</sup> Establishment year

<sup>2</sup> Tests sown as part of the Kentucky Forage Variety Testing Program

<sup>3</sup> Tests sown as part of the Kentucky Red Clover Breeding Program

<sup>4</sup> Harvest year

<sup>5</sup> Experimental varieties are not as yet available to the public

 Indicates that the variety was not in the test

\*\* Highest yielding variety in the test for that year

\* Not significantly different from the highest yielding variety in the test

**Table 8. University of Kentucky agricultural extension publications related to red clover management.**

<u>Publication</u>	<u>Title</u>
AGR-33	Growing red clover in Kentucky
AGR-2	Producing red clover seed in Kentucky
AGR-24	Kenstar red clover
AGR-64	Establishing forage crops
-----	Seed tags: What they reveal
AGR-26	Renovating hay and pasture fields
AGR-90	Inoculation of forage legumes
AGR-18	Grain and forage crop guide for Kentucky
AGR-1	Lime and fertilizer recommendations
AGR-148	Weed control strategies for alfalfa and other forage legume crops
ENT-17	Insecticide recommendations for alfalfa and clover