

1994 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.

Important Considerations in Selecting a Red Clover Variety

Local Adaptation and Persistence. The variety should be adapted to Kentucky as indicated by superior performance across years and locations in replicated yield trials such as those reported in this publication. High yielding varieties are generally also those varieties that are the most persistent. Red clover generally produces measurable yields for three years, including the establishment year, with the highest production occurring in the second year. Some varieties of red clover lose their stand after the end of the second year, while others that are not adapted to Kentucky conditions may not survive the first winter. These varieties be reseeded more often than more persistent varieties, increasing seed and establishment costs.

Seed Quality. Buy either certified or Plant Variety Protected (PVP) seed, which will guarantee that the genetics and performance you are paying for are in the bag. Look for the blue tag, which must be attached to all bags of certified seed or look for Plant Variety Protection labelling, which is the proprietor's guarantee. Other information on the label will include the test date, which must be within the previous nine months, and the level of germination and other crop and weed seed. Order seed well in advance of planting time to assure that it will be available when needed.

Description of the Tests

Five studies are included in this report. Two are part of the Kentucky Red Clover Breeding Program (sown in 1993 and 1994 at Lexington) and the other three are part of the Kentucky Forage Variety Testing Program (sown in 1992 and 1994 at Lexington and 1993 at Princeton). Both types of tests include experimental red clover lines from Kentucky and other states as well as private companies that may be available for sale in the future. In addition, these plots contain some commercially available lines and selected "common" red clovers. Common red clover, generally sold as "medium red clover variety unknown," is unimproved red clover with an unknown performance record. Altaswede, a mammoth or "single-cut" red clover developed in Canada is included for comparison.

Plots were 4 x 15 feet (4 x 10 ft for the Breeding tests) and were arranged in a randomized complete block design with four replications. Seedings were made at 12 pounds (7 lb for Breeding tests) of seed per acre into a prepared seedbed using a disk drill. 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 converted to dry matter production using long-term averages for dry matter percents for red clover.

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. With the exception of May, which was exceptionally cool at both locations, the spring was warmer than average at both locations. The summer and fall were much cooler than normal at Lexington, while Princeton had a near normal summer and fall. Precipitation was above average through May at Lexington, while it was near normal through April at Princeton. The remainder of the growing season was well below average at both locations.

Yield data (on an oven dry basis) and percent stand for all tests are presented in Tables 2-6. These tables list the varieties in order from highest to lowest total production (for the life of the test). Experimental varieties, which are not available for purchase, are listed separately at the bottom. Statistical analyses were performed on all red clover data (including experimentals) to determine if the apparent differences are truly due to variety or just due to chance. The variety with the highest numerical value in each column is marked with two asterisks (**) and those varieties not significantly different from that variety are marked with one asterisk (*). To determine if two varieties are truly different, compare the difference between the two varieties with 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.

Red clover yields across Kentucky in 1994 were somewhat less to those of 1993 for stands of comparable age. As expected with red clover, stands of most varieties in the 1992 seeding were gone by the end of the 1994 growing season. Some varieties in the 1992 Lexington test still had greater than 30% stand (Table 2); however, production by those cultivars was not great enough to be feasible to harvest. Although stands of most varieties were still good in the fall, the 1993 test at Princeton also did not produce measurable hay yields after August 3, probably due to low moisture. The first harvest of both of the 1994 Lexington tests was delayed because of slow establishment due to inadequate moisture and high temperatures.

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. Varieties are listed in alphabetical order with the experimental varieties at the bottom. Remember that the experimental varieties are not available for farm use, while commercial varieties can be purchased from dealerships. 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. 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. Remember to look at data from several years and locations when choosing a variety of red clover rather than results from one test year as is reported in Tables 2-6. Make sure seed of the variety selected is properly labelled and will be available when needed.

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 that are available from the local county extension office are listed in Table 8.

TABLE 1. TEMPERATURE AND RAINFALL IN LEXINGTON AND PRINCETON IN 1994.

MONTH	LEXINGTON				PRINCETON			
	TEMPERATURE		RAINFALL		TEMPERATURE		RAINFALL	
	F	DEP.	INCHES	DEP.	F	DEP.	INCHES	DEP.
JAN	25	-6	3.60	+0.03	30	-4	4.26	+0.40
FEB	36	+1	3.41	+0.15	41	+2	3.73	-0.71
MAR	43	-1	5.95	+1.12	49	+1	5.13	+0.69
APR	58	+3	6.02	+2.01	60	+1	5.48	+0.60
MAY	60	-4	4.05	-0.18	63	-6	0.84	-4.84
JUN	74	+2	2.01	-2.24	77	+2	4.19	+0.32
JUL	76	0	2.62	-2.33	78	0	3.89	-0.41
AUG	72	-3	5.86	+1.90	75	-1	1.69	-2.37
SEP	65	-3	1.43	-1.85	68	-1	2.28	-1.06
OCT	57	0	1.71	-0.55	61	+1	2.65	-0.67

TEMPERATURES ARE IN DEGREES FAHRENHEIT.

DEP. IS DEPARTURE FROM THE LONG-TERM AVERAGE FOR THAT LOCATION.

TABLE 2. DRY MATTER YIELDS (TONS/ACRE) AND PERCENT STAND RATINGS OF RED CLOVER

VARIETY	1994 % STAND		1992 TOTAL	1993 TOTAL	1994 HARVESTS						1994 TOTAL	3-YR TOTAL
	APR22	SEP03			APR25	MAY25	JUN27	AUG01	SEP04	OCT25		
COMMERCIAL VARIETIES - Available for farm use												
CINNAMON	82.50*	33.75*	3.68**	5.36*	0.48*	0.51	0.39	0.17	0.86**	0.06	2.47**	11.50**
KENSTAR	87.50**	32.50*	3.45*	5.24*	0.55**	0.50	0.46*	0.17	0.69	0.07*	2.45*	11.14*
KENLAND	72.50*	43.75*	3.15	5.54**	0.45*	0.41	0.53**	0.21**	0.70	0.11**	2.42*	11.11*
MARATHON	72.50*	21.25	3.36*	4.78	0.24	0.69**	0.20	0.11	0.58	0.03	1.86	9.99
ACCLAIM	71.25*	13.75	3.17*	4.65	0.31	0.48	0.31	0.11	0.65	0.03	1.89	9.71
ARLINGTON	71.67*	6.67	3.07	4.21	0.29	0.59*	0.23	0.10	0.68	0.01	1.89	9.17
COMMON-F	11.25	6.25	2.71	3.34	0.12	0.17	0.12	0.09	0.59	0.02	1.11	7.15
COMMON-E	25.00	3.75	2.96	2.81	0.09	0.50	0.10	0.06	0.53	0.01	1.29	7.06
ALTASWEDE	5.50	3.75	3.06	2.79	0.08	0.18	0.09	0.11	0.64	0.01	1.11	6.97
EXPERIMENTAL VARIETIES - Not available for farm use												
KENSTAR-II-SYN	78.75*	37.50*	3.33*	5.13*	0.45*	0.64*	0.42	0.15	0.67	0.11**	2.45*	10.90*
VIRUS-RESISTAN	78.75*	46.25**	3.34*	5.12*	0.51*	0.35	0.45*	0.17	0.70	0.10*	2.29*	10.75*
FUS	35.00	10.00	3.49*	4.61	0.20	0.37	0.25	0.12	0.71*	0.02	1.68	9.78
WVPB-RC-L	78.75*	21.25	3.13	4.48	0.35	0.48	0.33	0.13	0.64	0.04	1.97	9.57
MEAN	59.54	22.10	3.22	4.47	0.32	0.45	0.30	0.13	0.66	0.05	1.92	9.60
CV, %	27.30	56.97	11.22	10.72	42.88	22.70	22.09	20.46	16.84	78.25	11.44	7.57
LSD, 0.05	23.36	18.09	0.53	0.69	0.20	0.15	0.10	0.04	0.16	0.05	0.31	1.05

1992 TOTAL INCLUDES 3 HARVESTS DATED JUL08, AUG13, AND SEP17.

1993 TOTAL INCLUDES 6 HARVEST S DATED MAY07, JUN07, JUL12, AUG09, SEP14, AND OCT27.

**HIGHEST NUMERICAL VALUE IN THE COLUMN.

*NOT SIGNIFICANTLY DIFFERENT FROM THE HIGHEST NUMERICAL VALUE IN THE COLUMN BASED ON THE 5% LSD.

TABLE 3. DRY MATTER YIELDS (TONS/ACRE) AND PERCENT
STAND
RATINGS OF RED CLOVER VARIETIES SOWN 28 APR 1993 AT

VARIETY	MAY05	1994 HARVESTS			1994
	% STAND	MAY11	JUN16	SEP15	TOTAL
COMMERCIAL VARIETIES - Available for farm use					
REDDY	92.25*	1.74*	0.36*	1.67**	3.77**
CINNAMON	96.75*	1.65*	0.29*	1.66*	3.60*
RENEGADE	99.00**	1.75**	0.40**	1.31	3.46*
RUBY	89.75*	1.54*	0.33*	1.37*	3.24*
REDSTAR	91.25*	1.46*	0.27	1.42*	3.14*
ACCLAIM	82.50	1.27	0.27	1.53*	3.07
REDLAND-III-BRAND	87.50*	1.38	0.23	1.44*	3.06
CHEROKEE	86.25*	1.29	0.18	1.38*	2.85
ARLINGTON	73.75	1.12	0.22	1.35*	2.69
SCARLETT	75.00	1.04	0.17	1.36*	2.58
RED-BARON	58.75	0.85	0.23	1.36*	2.45
EXPERIMENTAL VARIETIES - Not available for farm use					
C/W2004	83.75	1.42*	0.21	1.44*	3.07
ISI-84-KM	85.75*	1.31	0.34*	1.38*	3.03
KENSTAR-II-SYN-I	88.75*	1.45*	0.28*	1.29	3.01
C/W2002	78.75	1.27	0.27	1.46*	3.00
C/W2001	77.50	1.07	0.18	1.44*	2.69
C/W2003	71.25	0.99	0.17	1.33	2.48
MEAN	83.44	1.33	0.26	1.42	3.01
CV	12.73	19.12	34.60	16.11	16.01
LSD	15.10	0.36	0.13	0.33	0.69

NO HARVESTS WERE TAKEN IN 1993

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TABLE 4. DRY MATTER YIELDS (TONS/ACRE) OF

VARIETY	1994 HARVESTS			1994
	AUG01	SEP05	OCT26	TOTAL
COMMERCIAL VARIETIES - Available for farm use				
CINNAMON	0.37**	1.09*	0.50*	1.96**
KENSTAR	0.33*	1.07*	0.50*	1.90*
KENLAND,	0.31*	1.06*	0.51**	1.87*
KENLAND,	0.30*	1.06*	0.46*	1.82*
COMMON-K	0.33*	1.00*	0.49*	1.81*
GREENSTAR	0.26	0.98*	0.51**	1.76*
COMMON-L	0.30*	0.92*	0.51**	1.73*
ATLAS	0.28*	0.78	0.44*	1.50
COMMON-M	0.27	0.74	0.33	1.33
COMMON-N	0.22	0.73	0.27	1.21
EXPERIMENTAL VARIETIES - Not available for				
WVPB-F-5	0.26	1.11**	0.42*	1.79*
KY-NON-HAIRY	0.30*	1.02*	0.46*	1.78*
WVPB-A-4	0.30*	0.96*	0.41*	1.67*
WVPB-1102	0.26	0.93*	0.39*	1.58*
MEAN	0.29	0.96	0.44	1.69
CV, %	23.62	18.70	28.24	16.10
LSD, 0.05	0.10	0.26	0.18	0.39

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ICAL VALUE IN THE COLUMN BASED ON THE 5%
LSD.

TABLE 5. DRY MATTER YIELDS (TONS/ACRE) AND PERCENT
STAND
RATINGS OF RED CLOVER VARIETIES SOWN 12 MAY 1994 AT

VARIETY	PERCENT STAND HARVEST			1994
	JUN15	AUG30	AUG19	TOTAL
COMMERCIAL VARIETIES - Available for farm use				
CHEROKEE	87.50*	81.25*	1.73*	1.73**
KENLAND	87.50*	87.50*	1.50*	1.50*
TEMARA-TETRAPLOID	58.75	52.50	1.49*	1.49*
CINNAMON	77.50	78.50*	1.43*	1.43*
ACCLAIM	85.00*	79.75*	1.35*	1.35*
RENEGADE	82.50*	88.75**	1.31*	1.31*
SCARLETT	87.50*	80.00*	1.29*	1.29*
KENSTAR	85.00*	86.25*	1.28*	1.28*
TEDI-TETRAPLOID	73.75	62.50	1.28*	1.28*
REDSTAR	33.75	50.00	1.28*	1.28*
RUBY	95.00**	87.50*	1.25	1.25
MARATHON	82.50*	73.75*	1.24	1.24
ARLINGTON	65.00	71.25	1.08	1.08
EXPERIMENTAL VARIETIES - Not available for farm use				
KY-NON-HAIRY	86.25*	86.25*	1.25	1.25
UNREDUCED-GAMETE-TETRAPL	41.25	61.25	1.12	1.12
MEAN	75.25	75.13	1.33	1.33
CV	14.84	15.02	24.88	24.88
LSD	15.93	16.10	0.47	0.47

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TABLE 6. DRY MATTER YIELDS (TONS/ACRE) OF RED CLOVER VARIETIES

VARIETY	1993	1994 HARVESTS					1994	2-YR
	TOTAL	MAY02	JUN01	JUN30	AUG03	OCT27	TOTAL	TOTAL
COMMERCIAL VARIETIES - Available for farm use								
CINNAMON	1.53**	1.54**	0.48*	1.05**	0.90**	0.10*	4.06**	5.59**
KENLAND, CERTIFIED	1.26*	1.37*	0.54*	0.93*	0.79*	0.14**	3.77*	5.03*
COMMON-I,RC	1.28*	1.32*	0.56**	0.90*	0.87*	0.09*	3.73*	5.02*
GREENSTAR	1.14*	1.19*	0.42*	0.82*	0.68*	0.12*	3.25*	4.38*
KENSTAR	1.05	1.25*	0.44*	0.83*	0.66*	0.08*	3.26*	4.32*
KENLAND, UNCERTIFIED	0.94	1.10*	0.40*	0.72	0.63*	0.06	2.90*	3.84
ACCLAIM	0.95	1.08	0.31	0.72	0.63*	0.05	2.77	3.72
COMMON-H,RC	0.93	1.04	0.34	0.67	0.53	0.07	2.65	3.57
ARLINGTON	0.92	1.00	0.29	0.71	0.59	0.04	2.64	3.55
REDLAND-III-BRAND	0.64	0.81	0.24	0.51	0.37	0.05	1.98	2.62
COMMON-G,RC	0.54	0.37	0.18	0.20	0.13	0.02	0.91	1.45
COMMON-J,RC	0.16	0.16	0.08	0.07	0.03	0.02	0.36	0.51
ALTASWEDE	0.12	0.07	0.04	0.02	0.04	0.01	0.18	0.30
EXPERIMENTAL VARIETIES - Not available for farm use								
VIRUS-RESISTANT	1.25*	1.43*	0.51*	0.98*	0.84*	0.09*	3.85*	5.10*
WVPB-RC-91-100	1.13*	1.16*	0.43*	0.78*	0.63*	0.08*	3.08*	4.20*
WVPB-RC-91-200	0.75	1.02	0.33	0.61	0.46	0.05	2.47	3.22
WVPB-RC-91-300	0.68	0.80	0.29	0.44	0.37	0.07	1.96	2.64
MEAN	0.90	0.98	0.35	0.65	0.54	0.06	2.58	3.47
CV, %	31.97	33.11	35.11	33.64	40.43	74.63	33.55	32.48
LSD, 0.05	0.41	0.46	0.17	0.31	0.31	0.07	1.23	1.60

1993 TOTAL INCLUDES 3 HARVESTS DATED JUL15, SEP15, AND OCT26.

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Table 7. Characterization and performance across years and locations of red clover varieties
 1994 Kentucky Red Clover Variety Test Report
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Variety		Proprietor/KY Distributor		Lexington						Princeton	
				1992 ^{1,2}			1993 ³	1994 ²	1994 ³	1993 ²	
				92 ⁴	93	94	94	94	94	93	94
COMMERCIAL VARIETIES - Available for farm use											
Acclaim	Allied Seed Coop./Scott Seed	*					*				
Altaswede	Farmer ecotype, Canada/Public										
Arlington	WI Agric. Exp. Sta./Public	*									
Atlas	Northrup King										
Cherokee	FL Agric. Exp. Sta./Public						*				
Cinnamon	FFR/Southern States	**	*	**	*	**	*	**	**		
Common E	Farmer ecotype/Public										
Common F	Farmer ecotype/Public										
Common G	Farmer ecotype/Public										
Common H	Farmer ecotype/Public										
Common I	Farmer ecotype/Public							*	*		
Common J	Farmer ecotype/Public										
Common K	Farmer ecotype/Public					*					
Common L	Farmer ecotype/Public					*					
Common M	Farmer ecotype/Public										
Common N	Farmer ecotype/Public										
Greenstar	Genesis Turf and Forage/Green Seed					*			*		
Kenland, certified seed	KY Agric. Exp. Sta./Public		**	*		*	*	*	*		
Kenland, uncertified seed	Public					*			*		
Kenstar	KY Agric. Exp. Sta./Public	*	*	*		*	*		*		
Marathon	WI Agric. Exp. Sta./Public	*									
Red Baron	Vista Seeds										
Reddy	FFR/Southern States				**						
Redland III Brand/Concorde	ABI										
Red Star	Vista Seeds				*		*				
Renegade	International Seeds/Green Seed				*		*				
Ruby	Dairyland				*						
Scarlett	Dairyland						*				
Tedi Tetraploid	France						*				

Temara Tetraploid	France						*		
EXPERIMENTAL VARIETIES - Not available for farm use									
C/W-2001	Cal/West Seeds/Experimental								
C/W-2002	Cal/West Seeds/Experimental								
C/W-2003	Cal/West Seeds/Experimental								
C/W-2004	Cal/West Seeds/Experimental								
Fus	International Seeds/Experimental	*							
ISI-84-KM	International Seeds								
Kenstar II Syn I	KY Agric. Exp. Sta./Experimental	*	*	*					
Kentucky Non-Hairy	KY Agric. Exp. Sta./Experimental					*			
Kentucky Tetraploid	KY Agric. Exp. Sta./Experimental								
Root Rot Selection	KY Agric. Exp. Sta./Experimental								
Unreduced Gamete Tetraploid	KY Agric. Exp. Sta./Experimental								
Virus Resistant	KY Agric. Exp. Sta./Experimental	*	*	*				*	*
WVPB-1102	Willamette Valley Plant Breeders/Experimental					*			
WVPB-A-4	Production Service International/Experimental					*			
WVPB-F-5	Production Service International/Experimental					*			
WVPB-RC-91-100	Willamette Valley Plant Breeders/Experimental								*
WVPB-RC-91-200	Willamette Valley Plant Breeders/Experimental								
WVPB-RC-91-300	Willamette Valley Plant Breeders/Experimental								

¹ Establishment year

² Tests sown as part of the Kentucky Forage Variety Testing Program

³ Tests sown as part of the Kentucky Red Clover Breeding Program

⁴ Harvest year

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
PPA-10d	Kentucky plant disease management guide for forage legumes
ENT-17	Insecticide recommendations for alfalfa and clover

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