



# The 1999 Red Clover Report

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## Introduction

Red clover (*Trifolium pratense*) is a high-quality, short-lived, perennial legume that is used in mixed or pure stands for pasture, hay, silage, green chop, soil improvement, and wildlife habitat. This species is adapted to a wide range of climatic and soil conditions and therefore is 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, high 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 yield and persistence (as measured by percent stand) 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 and percent stand 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, with the year of establishment considered the first year. The highest yields occur in the year following establishment.

Some varieties of red clover go out of stand by the end of the second year, while others that are not adapted to Kentucky conditions may not survive the first winter.

**Seed Quality.** Buy high-quality seed that is high in germination and purity and free from weed seed. Buy certified seed or proprietary seed of an improved variety. An improved variety is one that has performed well in independent trials such as are reported in this publication and others like it. Other information on the label will include the test date, which must be within the previous nine months, 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

Four studies are included in this report. One is part of the Kentucky Red Clover Breeding Program (sown in 1998 at Lexington), and the other three are part of the Forage Variety Testing Program (sown at Lexington and at Quicksand in 1998 and at Princeton in 1999). The soils at Lexington (Maury), Quicksand (Pope), and Princeton (Crider), were well-drained silt loams. All are well suited to red clover production. Plots were 5 x 15 feet and were arranged in a randomized complete block design with four replications. Seedings were made at 12 pounds of seed per acre into a prepared seedbed using a disk drill. The first cutting in the seeding year was delayed to allow the red clover to completely reach maturity as indicated by full bloom, which generally occurs about 60 to 90 days after seeding. Otherwise, harvests were taken when the red clover was in the bud to early-flower stage using a sickle-type forage plot harvester. Fresh weight samples were taken at each harvest to calculate percent dry matter production. All tests for establishment, fertility, and harvest management were managed according to University of Kentucky Cooperative Extension Service recommendations. Weeds were controlled so as to not limit production or persistence.

## Results and Discussion

Weather data for Lexington, Quicksand, and Princeton are presented in Table 1. The 1999 growing season was hotter and drier than in any recent year. From June through the end of the year lack of rainfall severely affected production and resulted in a loss of stand at Lexington.

Yield data (on a dry matter basis) and observations for percent stand are presented in Tables 2 through 5. Yields are given by cutting date and as total annual production. Varieties are listed in order from highest to lowest total production (for the life of the test). Experimental varieties are listed separately at the bottom of the tables and are not available commercially.

Statistical analyses were performed on all red clover data (including experimental varieties) to determine if the apparent differences are truly due to variety or due just to chance. Varieties not significantly different from the top variety within a column 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 (LSD) at the bottom of the column. If the difference is equal to or greater than the LSD, the varieties are truly different when grown under the conditions at a given 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 a study results in higher CVs and larger LSDs.

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 addition to the commercially available varieties and experimental lines, selected "common" red clovers are included in the variety tests for comparison. Common red clover, generally sold as "medium red clover variety unknown," is unimproved red clover with an unknown performance record. Several of the "common" varieties performed quite well in the first year in several tests; however, they generally did not yield well after that. Some of the "common" types yielded well in both years, but they are the exception, and selecting a variety based on the exception is risky at best. Several years of testing show only about one out of every 10 common red clovers is as productive as the certified or proprietary red clovers.

Table 6 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. Experimental varieties are not available for farm use, but commercial varieties can be purchased from dealerships. In Table 6, a shaded area indicates that the variety was not included in that particular test (labeled at the top of the column), and a clear block means that the variety was included in the test. A single asterisk (\*) means that the variety was not significantly different from the highest-yielding variety. 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 through 5. Make sure seed of the variety selected is properly labeled 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. In Kentucky, harvesting at the appropriate stage of maturity will produce three cuttings in the seeding year and four to five cuttings every year thereafter before mid-September.

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 below:

- AGR-1 *Lime and Fertilizer Recommendations*
- AGR-2 *Producing Red Clover Seed in Kentucky*
- AGR-18 *Grain and Forage Crop Guide for Kentucky*
- AGR-24 *Kenstar Red Clover*
- AGR-26 *Renovating Hay and Pasture Fields*
- AGR-33 *Growing Red Clover in Kentucky*
- AGR-64 *Establishing Forage Crops*
- AGR-90 *Inoculation of Forage Legumes*
- AGR-148 *Weed Control Strategies for Alfalfa and Other Forage Legume Crops*
- ENT-17 *Insect Management Recommendations for Field Crops and Livestock*
- PPA-10d *Kentucky Plant Disease Management Guide for Forage Legumes*

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**Table 1. Temperature and rainfall at Quicksand, Lexington, and Princeton in 1999.**

MON	Quicksand				Lexington				Princeton			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	39	+8	6.29	+3.00	36	+5	5.64	+2.78	40	+6	8.82	+5.02
FEB	41	+8	3.18	-0.42	40	+5	2.32	-0.89	46	+8	2.22	-2.21
MAR	42	+1	3.09	-1.25	40	-4	3.27	-1.13	46	-1	4.07	-0.87
APR	60	+7	3.49	-0.61	56	+1	1.87	-2.01	63	+4	5.85	+1.05
MAY	66	+4	2.48	-2.00	65	+1	1.35	-3.12	68	+1	3.34	-1.62
JUN	73	+3	2.65	-1.17	74	+2	3.89	+0.23	76	+1	4.52	+0.67
JUL	78	+4	2.59	-2.66	80	+4	1.00	-4.00	82	+4	4.61	+0.32
AUG	74	+1	6.62	+2.61	75	0	1.31	-2.62	79	+2	1.00	-3.01
SEP	69	+3	1.13	-2.39	69	+1	1.03	-2.17	73	+2	0.72	-2.61
OCT	58	+4	3.07	+0.16	57	0	1.91	-0.66	62	+3	3.45	+0.40
NOV	53	+11	2.65	-1.23	51	+6	1.70	-1.69	57	+10	3.22	-1.41

Dep is departure from the long-term average for that location.

**Table 2. Dry matter yields (tons/acre) and percent stand of red clover varieties sown 14 May 1998 at Lexington, Kentucky.**

Variety	% Stand Apr 30, 1999	1998 Total	1999 Harvests		1999 Total	2-yr Total
			May 17	Jul 7		
<b>Commercial Varieties — Available for Farm Use</b>						
Kenstar	93.5*	2.35*	2.20*	0.37*	2.57*	4.92*
Renegade	93.8*	2.39*	2.04*	0.44*	2.48*	4.87*
Kenland	91.3*	2.18*	2.12*	0.43*	2.55*	4.73*
Cinnamon	83.8*	2.18*	2.12*	0.34	2.46*	4.64*
Acclaim	83.8*	2.03*	1.99*	0.45*	2.44*	4.47*
Wildcat	82.5*	2.33*	1.71	0.35	2.06	4.39*
Arlington	75.0	2.11*	1.88	0.35	2.23*	4.34*
Red Baron	78.8*	1.79	2.11*	0.42*	2.53*	4.33*
Marathon	83.8*	2.05*	1.88*	0.32	2.20*	4.25
Cherokee	77.5	2.11*	1.80	0.26	2.06	4.17
Scarlett	83.8*	2.12*	1.67	0.29	1.96	4.08
Ram	70.0	1.99*	1.66	0.34	2.00	3.99
Concorde	65.0	1.93*	1.53	0.37	1.91	3.84
<b>Experimental Varieties — Not Available for Farm Use</b>						
KY Low phenol	83.8*	2.09*	2.15*	0.41*	2.56*	4.65*
Freedom!	85.0*	2.03*	2.01*	0.42*	2.43*	4.46*
Kenstar 2	86.3*	2.06*	1.83	0.35	2.19	4.25
KY tetraploid	65.0	2.17*	1.62	0.38*	2.00	4.17
KY virus resistant	81.3*	1.64	2.03*	0.36*	2.39*	4.03
FLMR 7	63.8	2.13	1.52	0.27	1.79	3.92
FL 5	70.0	1.96	1.69	0.25	1.94	3.90
Mean	79.90	2.08	1.88	0.36	2.24	4.32
CV, %	11.70	17.96	12.14	18.82	12.19	9.83
LSD, 0.05	15.35	0.53	0.32	0.10	0.39	0.60

\* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

**Table 3. Dry matter yields (tons/acre) and percent stand of red and white clover varieties sown 13 August 1998, at Lexington, Kentucky.**

Variety	% Stand Nov 18, 1999	1999 Harvests			1999 Total
		May 25	Jun 30	Aug 18	
<b>Commercial Varieties — Available for Farm Use</b>					
Kenland Certified	27.5	3.09*	0.67*	0.33*	4.10*
Cinnamon	22.5	3.25*	0.52*	0.26*	4.03*
Greenstar	12.5	3.06*	0.61*	0.21*	3.87*
Common Y	12.5	3.11*	0.52*	0.17	3.80*
Solid	12.5	3.11*	0.49	0.19	3.79*
Kenstar	12.5	3.18*	0.45	0.16	3.78*
Syn3-92	22.5	3.01*	0.51	0.16	3.68
Common Z	3.0	2.97*	0.54*	0.12	3.63
Common X	0.0	2.94*	0.50	0.14	3.58
Royal Red	12.5	2.92*	0.43	0.21*	3.56
Kenland Uncertified	5.0	2.68	0.57*	0.13	3.39
Regal Ladino (white)	45.0*	1.66	0.20	0.01	1.88
California Ladino (white)	32.5*	1.40	0.17	0.05	1.61
<b>Experimental Varieties — Not Available for Farm Use</b>					
Freedom!	27.5	3.26*	0.67*	0.30*	4.24*
97L381749	17.5	3.11*	0.41	0.23*	3.75*
ZR9701R	10.0	2.99*	0.33	0.10	3.43
Mean	17.2	2.86	0.47	0.17	3.51
CV, %	61.6	8.53	23.24	54.30	10.26
LSD, 0.05	1.51	0.35	0.02	0.13	0.51

\* Not significantly different from the highest value in the column, based on the 0.05 LSD.

**Table 4. Dry matter yields (tons/acre) and percent stand of red and white clover varieties sown 13 April 1998, at Quicksand, Kentucky.**

Variety	% Stand Sep 2, 1999	1998 Total	1999 Harvests					1999 Total	2-yr Total
			May 19	Jun 23	Jul 23	Sep 2	Oct 26		
<b>Commercial Varieties — Available for Farm Use</b>									
Kenland Certified	71.3	1.34*	2.22*	1.68*	0.97*	0.88*	0.81*	4.87*	6.21*
Royal Red	67.5	1.08	2.39*	1.49	1.01*	0.84*	0.64	4.90*	5.98*
Kenstar	58.8	1.24*	2.10	1.54*	0.96*	0.87*	0.69*	4.61*	5.84*
Greenstar	62.5	1.15*	2.09	1.61*	0.96*	0.71	0.65	4.66*	5.81*
Cinnamon	63.8	1.10	2.16*	1.42	0.97*	0.84*	0.68	4.56*	5.66
Solid	66.3	1.06	2.00	1.53*	0.98*	0.80*	0.63	4.52*	5.58
Common Y	42.5	0.87	2.38*	1.36	0.76	0.50	0.49	4.50*	5.36
Common X	18.8	0.92	2.42*	0.99	0.66	0.49	0.30	4.08	5.00
Kenland Uncertified	15.0	1.01	2.15*	1.10	0.71	0.48	0.35	3.95	4.96
Common Z	12.5	0.75	2.36*	1.20	0.64	0.40	0.34	4.20	4.95
California Ladino (white)	87.5*	0.95	2.03	0.73	0.60	0.25	0.38	3.37	4.32
Regal Ladino (white)	87.5*	0.99	1.91	0.88	0.52	0.18	0.41	3.32	4.31
<b>Experimental varieties — Not available for farm use</b>									
ZR9701R	72.5	1.02	2.55*	1.31	0.97*	0.80*	0.67	4.83*	5.85*
Freedom!	73.8	1.25*	1.72	1.73*	1.05*	0.88*	0.74*	4.50*	5.75*
Syn3-92	17.0	1.06	2.39*	1.18	0.80	0.38	0.36	4.37	5.43
Mean	54.5	1.05	2.19	1.32	0.84	0.62	0.54	4.35	5.40
CV,%	15.8	13.14	13.97	12.47	9.00	12.07	15.91	7.20	6.67
LSD, 0.05	12.3	0.20	0.44	0.24	0.11	0.11	0.12	0.45	0.51

\* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

**Table 5. Dry matter yields (tons/acre) of red clover varieties sown 14 April 1999, at Princeton, Kentucky.**

Variety	1999 Harvests		1999 Total
	Jul 20	Nov 11	
<b>Commercial Varieties — Available for Farm Use</b>			
Cinnamon	2.66*	0.24*	2.90*
Kenland Certified	2.47*	0.32*	2.79*
Plus	2.42*	0.28*	2.70*
Solid	2.34	0.29*	2.63*
Redlangraze	2.33	0.17	2.50
Belle	2.16	0.12	2.28
Common X	1.93	0.25*	2.18
Common Y	1.81	0.24*	2.06
Royal Red	1.86	0.20	2.06
Common Z	1.43	0.12	1.54
Mammoth	1.22	0.06	1.27
<b>Experimental Varieties — Not Available for Farm Use</b>			
KNARS	2.12	0.23*	2.35
Freedom!	2.09	0.17	2.26
Virus resistant	2.03	0.09	2.12
Mean	2.06	0.20	2.26
CV,%	10.63	41.17	12.05
LSD, 0.05	0.31	0.12	0.39
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.			

Table 6. Performance of red clover varieties across years and locations.		Lexington			Quicksand		Princeton
		1998 <sup>1,2</sup>		1998 <sup>3</sup>	1998 <sup>3</sup>		1999 <sup>3</sup>
Variety	Proprietor/KY Distributor	98 <sup>4</sup>	99	99	98	99	99
<b>Commercial Varieties — Available for Farm Use</b>							
Acclaim	Allied Seed Coop./Scott Seed	*	*				
Arlington	Wisconsin Agric. Exp. Sta.	*	*				
Belle	Agribiotech						
California Ladino	Public						
Cherokee	University of Florida	*					
Cinnamon	FFR/Southern States	*	*	*		*	*
Common Y	Farmer ecotype/Public			*		*	
Common X	Farmer ecotype/Public						
Common Z	Farmer ecotype/Public						
Concorde	ABI Alfalfa Inc.	*					
Greenstar	Genesis Turf and Forage/Gre en Seed			*	*	*	
Kenland, certified	KY Agric. Exp. Station	*	*	*	*	*	*
Kenland, uncertified	Public						
Kenstar	KY Agric. Exp. Station	*	*	*	*	*	
Mammoth	Public						
Marathon	WI Agric. Exp. Station	*	*				
Plus	Allied Seed						*
Ram	ABI Alfalfa Inc.	*					
Red Baron	Vista Seeds		*				
Redlandgraze	ABI Alfalfa Inc.						
Regal Ladino	Public						
Renegade	International Seeds/Green Seed	*	*				
Royal Red	FFR Cooperative					*	
Scarlett	Dairyland	*					
Solid	Production Service Int'l			*		*	*
Syn3-92							
Wildcat	Olsen-Fennell Seeds/Hansford Seed	*					
<b>Experimental Varieties — Not Available for Farm Use</b>							
97L381749	KY Agric. Exp. Station						
Freedom!	KY Agric. Exp. Station	*	*	*	*	*	
FL 5	University of Florida						
FLMR 7	University of Florida						
KNARS	KY Agric. Exp. Station						
Kenstar 2	KY Agric. Exp. Station	*					
Ky low phenol	KY Agric. Exp. Station	*	*				
Ky tetraploid	KY Agric. Exp. Station	*					
Virus Resistant	KY Agric. Exp. Station		*				
ZR9701R	ABI/Experimental					*	

<sup>1</sup> Establishment year.

<sup>2</sup> Tests sown as part of the Kentucky Red Clover Breeding Program.

<sup>3</sup> Tests sown as part of the Forage Variety Testing Program.

<sup>4</sup> Harvest year.

Shaded boxes indicate the variety was not in the test for that year. Open boxes indicate the variety was significantly lower in yield than the top-ranking variety in the test for that year. An asterisk (\*) indicates that variety was not significantly different from the top-ranking variety in the test for that year.

