



# 2000 Red Clover Report

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

## 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 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 as 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

Six studies are included in this report. This includes two studies at Princeton (sown in 1999 and 2000), one at Lexington (sown 2000), one at Owenton (sown 2000), one at Quicksand (sown 1998), and one at a mine site near Laurel Fork (sown 1999). The soils at Princeton (Crider), Lexington (Maury), and Quicksand (Pope) were well-drained silt loams. Owenton has a Nicholson silt loam soil. All are well suited to red clover production. The planting medium at the strip mine site near Laurel Fork is material composed primarily of gray shale and sandstone. These materials are almost always very low in organic matter and frequently low in phosphorus and potassium. This medium can be well drained to the point of being droughty or poorly drained to the point of remaining flooded, depending on the particle size of the material below and degree of compaction. Plots were 5 x 15 feet and were arranged in a randomized complete block design with four replications at every location except at the mine site where six replications were used.

Seedings were made at 12 pounds of seed per acre into a prepared seedbed using a disk drill. The first cutting in the seedling 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 Quicksand, Owenton, Lexington, and Princeton are presented in Table 1. Temperature and rainfall for the 2000 growing season were closer to normal than in recent years.

Yield data (on a dry matter basis) are presented in Tables 2 through 7. 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. 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.

Certified Kenland continues to rank near the top of tests. It is important to note yield differences between certified and uncertified Kenland red clover. Often uncertified Kenland is available for sale but our tests show it is significantly lower in yield than certified Kenland.

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 8 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 8, 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 7. 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. Controlling weeds and maintaining soil fertility at recommended levels based on soil tests 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

## Authors

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

**Table 1. Temperature and Rainfall at Bowling Green, Eden Shale, Lexington, and Princeton in 2000.**

MON	Quicksand				Owenton				Lexington				Princeton			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	34	+3	2.25	-1.04	28	-4	4.39	+1.80	32	+1	3.48	+0.62	38	+4	5.86	+2.06
FEB	44	+11	3.12	-0.48	40	+4	5.72	+3.03	43	+8	4.97	+1.76	47	+9	5.36	+0.93
MAR	51	+10	2.16	-2.18	47	+2	3.33	-0.91	48	+4	3.47	-0.93	54	+7	4.23	-0.71
APR	55	+2	4.55	+0.45	52	-4	4.44	+0.69	53	-2	4.10	+0.22	59	0	5.77	+0.97
MAY	68	+6	7.79	+3.31	66	+2	4.66	+0.38	67	+3	2.96	-1.51	70	+3	5.03	+0.07
JUN	73	+3	8.86	+5.04	72	0	4.44	+0.60	73	+1	3.22	-0.44	76	+1	3.07	-0.78
JUL	73	-1	4.16	-1.09	73	-3	3.53	-0.71	74	-2	3.42	-1.58	78	0	4.51	+0.22
AUG	73	0	6.24	+2.23	73	-2	2.97	-0.38	74	-2	3.38	-0.55	80	+3	1.99	-2.02
SEP	67	+1	3.84	+0.32	65	-4	4.86	+1.98	66	-2	5.47	+2.27	71	0	4.13	+0.80
OCT	59	+5	0.43	-2.48	58	+1	1.37	-1.49	59	+2	0.92	-1.65	64	+5	1.15	-1.90
NOV	46	+4	1.11	-2.77	42	-4	2.33	-1.13	43	-2	1.59	-1.80	47	0	4.01	-0.62

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

Variety	1998 Total	1999 Total	2000 Harvests		2000 Total	3-yr Total
			May 5	Jun 30		
<b>Commercial Varieties — Available for Farm Use</b>						
Kenland, certified	1.34 *	6.55 *	1.50 *	1.19 *	2.69 *	10.59 *
Kenstar	1.24 *	6.17 *	1.60 *	1.12 *	2.71 *	10.12 *
Cinnamon	1.10	6.09	1.22	1.04	2.26	9.45
Greenstar	1.15 *	6.02	1.18	1.05 *	2.22	9.39
Solid	1.06	5.96	0.89	0.91	1.80	8.82
Common Y	0.87	5.48	0.49	0.70	1.19	7.53
Kenland, uncertified	1.01	4.78	0.73	0.78	1.51	7.30
California Ladino	0.95	3.99	1.36 *	0.94	2.29	7.24
Regal Ladino	0.99	3.91	1.30	0.98	2.28	7.18
Common X	0.92	4.86	0.37	0.77	1.14	6.92
Common Z	0.75	4.93	0.43	0.73	1.15	6.83
<b>Experimental Varieties — Not Available for Farm Use</b>						
Freedom!	1.25 *	6.12 *	1.74 *	1.14 *	2.88 *	10.26 *
RC 8702	1.08	6.38 *	1.38 *	1.06 *	2.43 *	9.89 *
ZR 9701R	1.02	6.30 *	0.93	0.90	1.82	9.14
Syn 3-92	1.06	5.10	0.55	0.83	1.38	7.55
Mean	1.05	5.51	1.04	0.94	1.99	8.55
CV, %	13.14	6.46	25.83	11.54	17.15	6.84
LSD, 0.05	0.2	0.51	0.38	0.16	0.49	0.83

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

Variety	1999 Total	2000 Harvests				2000 Total	2-yr Total
		May 16	Jun 22	Jul 20	Aug 29		
<b>Commercial Varieties — Available for Farm Use</b>							
Kenland, certified	2.79 *	2.28 *	2.05 *	0.63 *	0.53 *	5.49 *	8.28 *
Cinnamon	2.90 *	2.13	2.01 *	0.59 *	0.63 *	5.34 *	8.25 *
Solid	2.63 *	2.35 *	2.00 *	0.54 *	0.54 *	5.43 *	8.06 *
Plus	2.70 *	2.22	1.84	0.60 *	0.56 *	5.21 *	7.91 *
RedlanGraze	2.50	2.31 *	1.69	0.61 *	0.39	5.00	7.50
Belle	2.28	2.19	1.59	0.53	0.44 *	4.76	7.04
Common X	2.18	2.11	1.67	0.29	0.32	4.39	6.58
RoyalRed	2.06	2.13	1.67	0.28	0.37	4.44	6.50
Common Y	2.06	2.17	1.58	0.25	0.27	4.27	6.33
Common Z	1.54	2.11	1.43	0.23	0.45 *	4.22	5.76
Mammoth	1.27	2.23 *	0.83	0.35	0.29	3.70	4.98
<b>Experimental Varieties — Not Available for Farm Use</b>							
KNARS	2.35	2.20	2.04 *	0.57 *	0.56 *	5.37 *	7.72 *
Freedom!	2.26	2.33 *	2.00 *	0.54 *	0.41	5.27 *	7.54
KVMRS	2.12	2.29 *	1.98 *	0.62 *	0.42	5.31 *	7.43
Mean	2.26	2.22	1.74	0.47	0.44	4.87	7.13
CV, %	12.05	3.99	7.30	18.58	31.00	5.87	6.92
LSD, 0.05	0.39	0.13	0.18	0.13	0.20	0.41	0.71

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

**Table 4. Dry matter yields (tons/acre) of red clover varieties sown 3 March 2000 at Owenton, Kentucky.**

Variety	2000 Harvests			2000 Total
	Jun 29	Jul 26	Sep 14	
<b>Commercial Varieties — Available for Farm Use</b>				
Solid	1.00 *	1.43 *	1.29 *	3.72 *
Kenland, certified	0.75	1.39 *	1.34 *	3.48 *
Plus	0.81	1.49 *	1.08	3.38
RedGoldPlus	0.75	1.27	1.29 *	3.31
Starfire	0.91 *	1.38 *	1.01	3.30
Royal Red	0.81	1.37 *	1.06	3.23
Common B	0.64	1.18	1.26 *	3.08
Common A	0.82	1.12	1.08	3.03
Regal Ladino	0.65	1.22	1.11	2.98
<b>Experimental Varieties — Not Available for Farm Use</b>				
Freedom!	0.81	1.43 *	1.16	3.41 *
KNARS	0.86 *	1.37 *	1.18	3.41 *
KVMRS	0.63	1.36 *	1.24 *	3.23
Mean	0.79	1.33	1.18	3.30
CV,%	14.08	10.16	9.30	6.78
LSD, 0.05	0.16	0.20	0.16	0.32

\* 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 4 April 2000 at Lexington, Kentucky**

Variety	2000 Harvests		2000 Total
	Jul 27	Sep 15	
<b>Commercial Varieties — Available for Farm Use</b>			
Kenland, certified	1.86 *	1.34 *	3.20 *
Kenstar	1.69 *	1.27 *	2.96 *
Solid	1.65 *	1.30 *	2.96 *
RedGoldPlus	1.61 *	1.17	2.79
Impact	1.54	1.24 *	2.78
Common B	1.62 *	1.13	2.75
Starfire	1.56 *	1.17	2.73
Royal Red	1.44	1.21 *	2.65
Common A	1.42	1.08	2.49
<b>Experimental Varieties — Not Available for Farm Use</b>			
CW 5049	1.70 *	1.32 *	3.01 *
Freedom!	1.70 *	1.31 *	3.01 *
KVMRS	1.65 *	1.30 *	2.95 *
ZR9908R	1.70 *	1.20 *	2.90 *
Ky low phenolic	1.62 *	1.27 *	2.89 *
KNARS	1.64 *	1.21 *	2.85 *
ZR 9906R	1.57 *	1.27 *	2.84 *
CW9901	1.53	1.29 *	2.81 *
CW9810	1.45	1.24 *	2.68
CW9803	1.35	1.30 *	2.65
Mean	1.60	1.24	2.84
CV,%	14.11	8.71	9.91
LSD, 0.05	0.32	0.15	0.40

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

Variety	2000 Harvests			2000 Total
	Jun 23	Jul 19	Aug 29	
<b>Commercial Varieties — Available for Farm Use</b>				
Solid	1.46 *	0.88 *	2.10 *	4.44 *
Starfire	1.44 *	0.79 *	2.18 *	4.40 *
Impact	1.36 *	0.95 *	2.05 *	4.36 *
Kenland, certified	1.22	0.96 *	2.10 *	4.29 *
RedGoldPlus	1.46 *	0.79 *	1.91 *	4.16 *
Kenstar	1.23	0.88 *	1.97 *	4.08 *
Common B	1.24	0.81 *	1.76	3.81
Common C	1.23	0.65	1.76	3.65
Common A	1.16	0.65	1.79	3.60
<b>Experimental Varieties — Not Available for Farm Use</b>				
ZR 9908R	1.32 *	0.98 *	2.05 *	4.34 *
ZR 9906R	1.45 *	0.82 *	2.05 *	4.32 *
Freedom!	1.36 *	0.92 *	2.00 *	4.28 *
KNARS	1.21	0.81 *	2.04 *	4.06 *
Ky low phenolic	1.14	0.90 *	1.87 *	3.92
KVMRS	1.14	0.79 *	1.93 *	3.85
Mean	1.29	0.84	1.97	4.10
CV,%	10.61	18.27	11.63	7.63
LSD, 0.05	0.20	0.22	0.33	0.45
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.				

Variety	2000 Harvests		2000 Total
	May 25	Jul 17	
<b>Commercial Varieties — Available for Farm Use</b>			
Plus	1.37 *	1.51 *	2.88 *
Cinnamon	1.08 *	1.31 *	2.39 *
Prima	1.21 *	1.14 *	2.35 *
Belle	1.01 *	1.23 *	2.24 *
Solid	1.06 *	0.99	2.05
Common A	0.76	0.37	1.12
Vesna	0.55	0.50	1.05
Mammoth	0.43	0.61	1.04
Royal Red	0.56	0.44	1.00
<b>Experimental Varieties — Not Available for Farm Use</b>			
Freedom!	0.85	1.05	1.90
KVMRS	0.76	1.08	1.85
KNARS	0.77	0.95	1.73
Mean	0.87	0.93	1.80
CV,%	49.54	34.64	38.68
LSD, 0.05	0.50	0.37	0.81
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.			

Table 8. Performance of red clover varieties across years and locations.		Quicksand			mine site	Princeton			Lexington	Owenton
		1998 <sup>1</sup>			1999	1999	2000	2000	2000	
Variety	Proprietor/KY Distributor	98 <sup>2</sup>	99	00	00	99	00	00	00	00
<b>Commercial Varieties — Available for Farm Use</b>										
Belle	Agribiotech				*					
California Ladino	Public									
Cinnamon	FFR/Southern States		*		*	*	*			
Common A	Public									
Common B	Public									
Common C	Public									
Common Y	Farmer ecotype/Public		*							
Common X	Farmer ecotype/Public									
Common Z	Farmer ecotype/Public									
Greenstar	Genesis Turf & Forage/Green Seed	*	*							
Impact	Specialty Seeds							*		
Kenland, certified	KY Agric. Exp. Station	*	*	*		*	*	*	*	*
Kenland, uncertified	Public									
Kenstar	KY Agric. Exp. Station	*	*	*				*	*	
Mammoth	Public									
Plus	Allied Seed				*	*	*			
Prima	Public				*					
RedGoldPlus	Turner Seed Inc.							*		
RedlandGraze	ABI Alfalfa Inc.									
Regal Ladino	Public									
Royal Red	FFR Cooperative									
Solid	Improved Forages		*			*	*	*		*
Starfire	Ampac Seed Co.							*		
Vesna										
<b>Experimental Varieties — Not Available for Farm Use</b>										
CW 5049	Cal/West Seeds								*	
CW9803	Cal/West Seeds									
CW9810	Cal/West Seeds									
CW9901	Cal/West Seeds								*	
Freedom!	KY Agric. Exp. Station	*	*	*		*	*	*	*	*
KNARS	KY Agric. Exp. Station					*	*	*	*	*
Ky low phenolic	KY Agric. Exp. Station							*		
RC 8702	FFR Cooperative		*	*						
KVMRS	KY Agric. Exp. Station					*		*		
Syn 3-92										
ZR9701R	ABI Alfalfa Inc.		*							
ZR 9906R	ABI Alfalfa Inc.							*	*	
ZR9908R	ABI Alfalfa Inc.							*	*	
<sup>1</sup> Establishment year. <sup>2</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.										

Mention or display of a trademark, proprietary product, or firm in text or figures does not constitute an endorsement and does not imply approval to the exclusion of other suitable products or firms.

