



2001 Red Clover Report

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

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.

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

Seven studies are included in this report. This includes two studies at Princeton (sown in 1999 and 2000), three at Lexington (sown 2000), one at Owenton (sown 2000), and one at Quicksand (sown 2001). 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. Plots were 5 x 15 feet and were arranged in a randomized complete block design with four replications at every location.

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 2001 growing season were closer to normal than in recent years.

Yield data (on a dry matter basis) are presented in Tables 2 through 8. 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. Most Kenland offered for sale is uncertified, 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 unknown performance. Several of the common varieties performed 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. 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 9 summarizes information about proprietors, distributors, and yield performance across years and locations for all varieties currently included 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 9, 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 8. Make sure seed of the variety selected is properly labeled and will be available when needed.

Summary

Red clover can be a productive component of pasture and hayfields. Choose a variety with proven performance in yield and persistence.

Other College of Agriculture publications related to the establishment, management, and harvesting of red clover 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-10 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*
- G.L. Olson: *Research Technician, Red Clover Breeding, UK Agronomy*

Table 1. Temperature and rainfall at Bowling Green, Eden Shale, Lexington, and Princeton, Kentucky in 2001.

	Quicksand				Owenton				Lexington				Princeton			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
MON	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	34	+3	2.5	-0.8	30	-2	1.1	-1.5	31	0	0.9	-1.9	35	+1	1.6	-2.3
FEB	43	+10	3.7	+0.1	37	+1	1.8	-0.9	40	+5	3.2	0	44	+6	5.0	+0.5
MAR	42	+1	2.2	-2.2	40	-5	1.2	-3.1	40	-4	2.7	-1.7	44	-3	2.8	-2.1
APR	61	+8	1.7	-2.4	58	+2	1.6	-2.2	59	+4	1.7	-2.2	64	+5	2.2	-2.6
MAY	66	+4	4.4	-0.1	65	+1	5.1	+0.8	66	+2	4.9	+0.4	69	+2	2.5	-2.5
JUN	70	0	4.2	+0.4	70	-2	4.6	+0.7	71	-1	2.0	-1.6	74	-1	4.8	+1.0
JUL	73	-1	6.4	+1.2	75	-1	8.7	+4.5	75	-1	5.6	+0.6	80	+2	5.5	+1.2
AUG	75	+2	2.4	-1.6	75	0	5.0	+1.7	76	+1	4.8	+0.8	79	+2	4.0	-0.1
SEP	66	0	1.1	-2.4	65	-4	2.5	-0.4	65	-3	3.0	-0.2	69	-2	3.5	+0.2
OCT	58	+4	1.4	-1.6	55	-2	6.7	+3.9	56	-1	3.6	+1.1	61	+2	7.5	+4.4
NOV	55	+13	1.8	-2.1	50	+4	3.3	-0.1	51	+6	2.8	-0.6	54	+7	7.8	+3.2

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

Table 2. Dry matter yields (tons/acre) of red clover varieties sown 14 April 1999 at Princeton, Kentucky.

Variety	Total 1999	Total 2000	2001 Harvests			Total 2001	3-yr Total
			May 9	Jun 13	Jul 17		
Commercial Varieties — Available for Farm Use							
Kenland certified	2.79	5.49	1.28	1.12	0.78	3.17	11.46*
Cinnamon	2.90	5.34	1.20	0.99	0.83	3.01	11.26*
Solid	2.63	5.43	1.14	1.06	0.71	2.91	10.97*
Plus	2.70	5.21	1.16	0.92	0.78	2.87	10.78*
RedlanGraze	2.50	5.00	0.84	0.84	0.66	2.34	9.84
Belle	2.28	4.76	0.83	0.72	0.54	2.09	9.13
Common x	2.18	4.39	0.59	0.50	0.25	1.34	7.92
Common y	2.06	4.27	0.66	0.61	0.30	1.57	7.90
Royal Red	2.06	4.44	0.38	0.51	0.35	1.23	7.74
Common z	1.54	4.22	0.55	0.37	0.25	1.16	6.92
Mammoth	1.27	3.70	0.42	0.33	0.25	1.00	5.97
Experimental Varieties — Not Available for Farm Use							
KNARS	2.35	5.37	1.01	0.92	0.49	2.41	10.13
KVMRS	2.12	5.31	1.06	0.90	0.69	2.65	10.08
Freedom!	2.26	5.27	1.05	0.94	0.54	2.53	10.07
Mean	2.26	4.87	0.87	0.77	0.53	2.16	9.30
CV, %	12.05	5.87	26.64	22.54	31.90	22.69	9.72
LSD, 0.05	0.39	0.41	0.33	0.25	0.24	0.70	1.29

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

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

Variety	Total 2000	2001 Harvests				Total 2001	2-yr Total
		May 29	Jul 2	Aug 13	Sep 20		
Commercial Varieties — Available for Farm Use							
Solid	3.72	1.42	1.91	0.95	0.34	4.61	8.33*
Kenland certified	3.48	1.36	2.01	1.10	0.32	4.79	8.27*
Plus	3.38	1.47	1.70	0.98	0.28	4.44	7.82*
Red Gold Plus	3.31	1.36	1.66	1.02	0.35	4.38	7.70
Royal Red	3.23	1.35	1.85	0.94	0.27	4.40	7.63
StarFire	3.30	1.39	1.58	0.90	0.32	4.19	7.49
Common b	3.08	1.01	1.37	0.66	0.15	3.19	6.27
Common a	3.03	1.00	1.44	0.65	0.13	3.22	6.24
Regal (white clover)	2.98	0.64	1.01	0.72	0.38	2.76	5.74
Experimental Varieties — Not Available for Farm Use							
Freedom!	3.41	1.29	1.95	1.17	0.34	4.75	8.15*
KNARS	3.41	1.31	1.84	1.08	0.35	4.57	7.99*
KVMRS	3.23	1.38	1.87	1.05	0.32	4.62	7.85*
Mean	3.30	1.25	1.68	0.93	0.30	4.16	7.46
CV,%	6.78	7.56	6.60	14.15	20.84	6.59	5.51
LSD, 0.05	0.32	0.14	0.16	0.19	0.09	0.40	0.59

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

Table 4. Dry matter yields (tons/acre) of red clover varieties sown 4 April 2000 at Lexington, Kentucky.

Variety	Total 2000	2001 Harvests				Total 2001	2-yr Total
		May 12	Jun 19	Aug 2	Sep 23		
Commercial Varieties — Available for Farm Use							
Kenland	3.20	2.57	2.09	1.28	1.36	7.30	10.50*
Kenstar	2.96	2.51	2.04	1.25	1.19	7.00	9.96*
Solid	2.96	2.40	1.92	1.14	1.13	6.60	9.55
Impact	2.78	2.46	1.89	1.24	0.99	6.58	9.36
StarFire	2.73	2.33	1.87	1.21	0.97	6.37	9.10
Red Gold Plus	2.79	2.25	1.84	1.09	1.11	6.29	9.07
Royal Red	2.65	2.21	1.80	1.25	1.06	6.32	8.97
Common b	2.75	1.87	1.87	1.18	0.97	5.88	8.64
Common a	2.49	2.03	1.86	1.12	0.95	5.97	8.47
Experimental Varieties — Not Available for Farm Use							
KVMRS	2.95	2.43	1.96	1.26	1.25	6.91	9.85*
Freedom!	3.01	2.26	1.96	1.25	1.34	6.81	9.82*
ZR 9906R	2.84	2.58	1.88	1.29	1.14	6.90	9.73*
Ky Low Phenolic	2.89	2.43	1.90	1.24	1.21	6.78	9.68*
CW 5049	3.01	2.39	1.90	1.25	0.98	6.52	9.53
ZR 9908R	2.90	2.38	1.93	1.23	1.06	6.60	9.50
KNARS	2.85	2.16	2.03	1.12	0.94	6.25	9.09
CW 9901	2.81	2.33	1.74	1.21	0.95	6.23	9.05
CW 9803	2.65	2.16	1.71	1.23	1.00	6.10	8.75
CW 9810	2.68	2.19	1.69	1.20	0.96	6.04	8.73
Mean	2.84	2.31	1.89	1.21	1.08	6.50	9.33
CV,%	9.91	9.69	6.78	10.87	11.39	6.67	6.84
LSD, 0.05	0.40	0.32	0.18	0.18	0.18	0.62	0.91

* 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 2 May 2000 at Princeton, Kentucky.

Variety	Total 2000	2001 Harvests				Total 2001	2-yr Total
		Apr 26	Jun 13	Jul 18	Aug 22		
Commercial Varieties — Available for Farm Use							
Solid	4.44	2.10	3.14	1.56	1.26	8.05	12.49*
Kenland, certified	4.29	2.24	3.16	1.60	1.19	8.19	12.48*
Kenstar	4.08	2.18	3.10	1.48	1.26	8.03	12.11*
Impact	4.36	2.08	2.90	1.40	1.24	7.62	11.98*
StarFire	4.40	1.95	2.79	1.42	1.17	7.33	11.74*
Red Gold Plus	4.16	2.12	2.75	1.33	1.19	7.39	11.54
Common b	3.81	1.80	2.91	1.06	1.05	6.82	10.63
Common a	3.60	1.76	2.92	1.02	1.19	6.88	10.48
Common c	3.65	1.84	2.70	0.99	1.10	6.63	10.28
Experimental Varieties — Not Available for Farm Use							
Freedom!	4.28	2.10	3.12	1.50	1.31	8.04	12.32*
Ky Low Phenolic	3.92	2.12	3.14	1.39	1.32	7.97	11.88*
KVMRS	3.85	2.26	3.00	1.43	1.28	7.97	11.83*
ZR 9906R	4.32	2.06	2.76	1.52	1.13	7.48	11.80*
ZR 9908R	4.34	2.02	2.94	1.36	1.13	7.45	11.79*
KNARS	4.06	2.01	2.88	1.27	1.21	7.37	11.43
Mean	4.10	2.04	2.95	1.35	1.20	7.55	11.65
CV,%	7.63	5.37	6.36	9.25	11.37	4.55	5.10
LSD, 0.05	0.45	0.16	0.27	0.18	0.20	0.49	0.85

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

Table 6. Dry matter yields (tons/acre) of red clover varieties sown 29 March 2001 at Quicksand, Kentucky.

Variety	2001 Harvests			Total 2001
	Jul 3	Aug 6	Oct 10	
Commercial Varieties — Available for Farm Use				
Kenland certified	1.86	2.13	2.18	6.17*
Sienna	1.80	1.88	2.04	5.73*
Duration	1.89	1.89	1.87	5.64*
Emarwan	1.73	1.85	1.96	5.54*
Vesna (tetraploid)	1.60	1.77	2.04	5.41*
Rojo Diablo	1.73	1.75	1.74	5.22
Red Gold Plus	1.60	1.82	1.74	5.16
RedlanGraze II	1.63	1.69	1.67	4.99
Kenland uncertified	1.51	1.52	1.60	4.63
Common a	1.41	1.31	1.40	4.12
Experimental Varieties — Not Available for Farm Use				
Freedom!	1.81	2.03	2.10	5.94*
RC 9601	1.82	1.98	1.89	5.68*
RC 9301	1.82	1.88	1.94	5.63*
RC 9101	1.71	1.83	1.88	5.42*
NARN	1.73	1.92	1.73	5.38*
MR54	1.75	1.93	1.67	5.36*
Ky Tetraploid	1.50	1.92	1.92	5.34*
RC 9501	1.63	1.88	1.82	5.33*
ZR 9906R	1.64	1.76	1.87	5.27
RC 9803g	1.71	1.83	1.59	5.12
KVMRS cycle1	1.47	1.71	1.94	5.12
KNARS cycle2	1.49	1.68	1.78	4.95
BY 394	1.55	1.69	1.34	4.58
Mean	1.67	1.81	1.81	5.29
CV,%	10.75	12.21	17.58	11.27
LSD, 0.05	0.25	0.31	0.45	0.84
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.				

Table 7. Dry matter yields (tons/acre) of red clover varieties sown 14 April 2000 at Lexington, Kentucky.

Variety	Total 2000	2001 Harvests				Total 2001	2-yr Total
		May 11	Jun 21	Aug 2	Sep 23		
Commercial Varieties — Available for Farm Use							
Plus	2.63	1.86	1.72	0.84	0.59	5.00	7.63*
Cinnamon	2.70	1.73	1.68	0.75	0.56	4.72	7.43*
Royal Red	2.56	1.75	1.60	0.84	0.55	4.76	7.32*
Kenland certified	2.45	1.82	1.79	0.65	0.58	4.84	7.29*
Impact	2.55	1.71	1.61	0.68	0.50	4.50	7.05*
Redstart	2.57	1.69	1.68	0.52	0.57	4.46	7.04*
Rudolf	2.54	1.76	1.64	0.53	0.50	4.43	6.97*
Solid	2.44	1.74	1.65	0.45	0.52	4.36	6.80
Scarlet	2.47	1.63	1.51	0.57	0.47	4.18	6.65
StarFire	2.45	1.64	1.61	0.56	0.39	4.20	6.64
RedlanGraze	2.43	1.68	1.48	0.60	0.37	4.13	6.56
Prima	2.46	1.66	1.50	0.48	0.40	4.03	6.49
Robust	2.41	1.61	1.52	0.53	0.41	4.07	6.48
Belle	2.24	1.65	1.50	0.40	0.34	3.88	6.12
Cherokee	2.30	1.31	1.52	0.19	0.51	3.53	5.82
Experimental Varieties — Not Available for Farm Use							
Freedom!	2.67	1.66	1.63	0.78	0.55	4.62	7.29*
KVMRS	2.34	1.82	1.72	0.71	0.55	4.80	7.14*
KNARS cycle 2	2.36	1.71	1.70	0.65	0.50	4.56	6.92*
Ky Low Phenolic	2.27	1.62	1.59	0.59	0.50	4.30	6.57
FLMR 7	2.07	1.18	1.47	0.28	0.50	3.43	5.50
Mean	2.45	1.66	1.61	0.58	0.49	4.34	6.79
CV,%	9.83	8.99	8.98	24.56	35.85	9.58	8.25
LSD, 0.05	0.34	0.21	0.20	0.20	0.25	0.59	0.79

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

Table 8. Dry matter yields (tons/acre) of red clover varieties sown 13 April 2001 at Lexington, Kentucky.

Variety	2001 Harvests		Total 2001
	Jul 16	Aug 27	
Commercial Varieties — Available for Farm Use			
Rojo Diablo	1.17	0.93	2.11*
Kenland certified	1.18	0.90	2.08*
Sienna	0.96	0.98	1.94*
Red Gold Plus	1.14	0.75	1.89*
RedlanGraze II	0.86	0.64	1.50*
Duration	0.75	0.69	1.43
Common a	0.60	0.40	1.00
Vesna (tetraploid)	0.36	0.43	0.79
Experimental Varieties — Not Available for Farm Use			
RC 9501	0.87	0.96	1.83*
KVMRS cycle1	1.00	0.77	1.77*
RC 9101	0.93	0.83	1.76*
Freedom!	0.89	0.83	1.72*
Ky Tetraploid	0.83	0.76	1.59*
BY394	0.84	0.73	1.57*
NARN	0.74	0.80	1.54*
KNARS cycle2	0.81	0.72	1.52*
MR54	0.77	0.73	1.50*
RC 9803g	0.76	0.66	1.42
ZR 9906r	0.63	0.68	1.31
RC 9601	0.61	0.64	1.24
Mean	0.84	0.74	1.58
CV,%	34.34	28.55	29.49
LSD, 0.05	0.41	0.30	0.66
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.			

Table 9. Performance of red clover varieties across years and locations.

		Princeton				Lexington		Owenton		Quicksand	
		1999 ¹		2000		2000		2000		2001	
Variety	Proprietor/KY Distributor	99 ²	00	01	00	01	00	01	00	01	00
Commercial Varieties — Available for Farm Use											
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										
Duration	Cisco Companies										*
Emarwan	Turf-Seed, Inc.										*
Impact	Specialty Seeds				*						
Kenland, certified	KY Agric. Exp. Station	*	*	*	*	*	*	*	*	*	*
Kenland, uncertified	Public										
Kenstar	KY Agric. Exp. Station				*	*	*	*			
Mammoth	Public										
Plus	Allied Seed	*	*	*						*	
Red Gold Plus	Turner Seed Co.				*						
RedlanGraze	ABI Alfalfa Inc.										
RedlanGraze II	Americas Alfalfa										
Regal Ladino	Public										
Rojo Diablo	Great Plains Research Co.										
Royal Red	FFR Cooperative									*	
Sienna	Great Plains Research Co.										*
Solid	Production Service Int'l	*	*	*	*	*			*	*	
StarFire	Ampac Seed Co.				*						
Vesna	DLF - Jenks										*
Experimental Varieties — Not Available for Farm Use											
BY 394	Brett-Young Seeds LTD.										
CW 5049	Cal/West Seeds						*				
CW 9803	Cal/West Seeds										
CW 9810	Cal/West Seeds										
CW 9901	Cal/West Seeds						*				
Freedom!	KY Agric. Exp. Station		*	*	*	*	*	*	*	*	*
KNARS	KY Agric. Exp. Station		*		*		*	*	*	*	
Ky low phenolic	KY Agric. Exp. Station					*	*	*			
Ky tetraploid	KY Agric. Exp. Station										*
KVMRS	KY Agric. Exp. Station		*	*		*	*	*		*	
MR54	Forage Genetics International										*
NARN	Cebeco International Seeds, Inc.										*
RC 9101	Allied Seed, L.L.C.										*
RC 9301	FFR cooperative										*
RC 9501	FFR cooperative										*
RC 9601	Allied Seed, L.L.C.										*
RC 9803g	FFR cooperative										
ZR 9906R	Americas Alfalfa				*		*	*			
ZR 9908R	ABI Alfalfa Inc.				*		*				

¹ Establishment year.

² 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.

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