

The 1997 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 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 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 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 or others like it. 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

Four studies are included in this report. One is part of the Kentucky Red Clover Breeding Program (sown in 1996 at Lexington), and the other three are part of the Forage Variety Testing Program (sown in 1996 at Lexington and in 1996 and 1997 at Princeton). The soils at Lexington (Maury) 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 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 weights were measured in the field and converted to dry matter production using long-term averages for percent dry matter of red clover or by oven dry moisture contents from field samples. Management of all tests for establishment, fertility, and harvest management was 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 and Princeton are presented in Table 1. In general, the 1997 growing season was unseasonably cool and wet initially and drier and warmer than average in the latter half.

Yield data (on a dry matter basis) and observations for stand and vigor (in certain studies) 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 experimentals) to determine if the apparent differences are truly due to variety or just due 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. Atlaswede, a mammoth or "single-cut" red clover developed in Canada is also included. Several of the "common" varieties performed quite well in the first year in several tests; however, these generally do not yield well after that. Some of the "common" types yielded well in both years but these 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. Remember that the experimental varieties are not available for farm use, while commercial varieties can be purchased from dealerships. In Table 6, shaded areas indicate that the variety was not included in that particular test (labeled at the top of the column) while clear blocks mean that the variety was included in the test. 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 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. 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 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 here.

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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
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	Insect Management Recommendations for Field Crops and Livestock
PPA-10d	Kentucky Plant Disease Management Guide for Forage Legumes

	Lexington				Princeton			
	Temp		Rainfall		Temp		Rainfall	
MON	F	DEP	IN	DEP	F	DEP	IN	DEP
JAN	31	+0	2.94	+0.08	35	+1	2.74	-1.06
FEB	41	+6	2.62	-0.59	44	+6	3.83	-0.60
MAR	46	+2	13.06	+8.66	52	+5	13.11	+8.17
APR	49	-6	1.40	-2.48	54	-5	3.94	-0.86
MAY	58	-6	6.14	+1.67	63	-4	5.36	+0.40
JUN	70	-2	6.20	+2.54	74	-1	5.09	+1.24
JUL	75	-1	3.32	-1.68	79	+1	1.90	-2.39
AUG	72	-3	3.02	-0.91	77	-0	2.06	-1.95
SEP	66	-2	1.47	-1.73	71	-0	3.89	+0.56
OCT	56	-1	1.92	-0.65	68	+9	0.88	2.17

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

Table 2. Dry matter yields (tons/A) of red clover varieties sown 17 April 1996 at Lexington, Kentucky.

Variety	Stand ¹ Aug 1	Vigor ² Aug 1	1996 Total	1997 Harvests				1997 Total	2-yr Total
				May 21	Jul 2	Aug 19	Nov 11		
Commercial Varieties - Available for Farm Use									
KENLAND, CERTIFIED	90.00*	8.50*	6.16*	1.25*	2.08*	1.17*	0.48*	4.98*	11.14*
COMMON-U	82.50*	8.50*	6.09*	1.15*	1.63*	1.12*	0.40*	4.31*	10.39*
RED-GOLD	87.50*	8.00*	5.62*	1.33*	1.75*	1.13*	0.29*	4.51*	10.12*
ROBUST	92.50*	6.50*	5.43*	1.43*	1.84*	1.06*	0.23	4.56*	9.99*
COMMON-T	70.00	5.75	5.79*	1.15*	1.71*	0.99*	0.29	4.15*	9.94*
KENLAND, UNCERTIFIED	70.00	4.75	5.43*	1.35*	1.74*	0.85	0.26	4.20*	9.63
WILDCAT	65.00	4.75	5.62*	1.27*	1.72*	0.83	0.16	3.97*	9.59
CONCORDE	90.00*	7.75*	4.58	1.36*	1.97*	1.19*	0.42*	4.94*	9.52
CINNAMON	80.00*	6.50*	5.76*	0.96	1.36	1.07*	0.23	3.62	9.38
COMMON-S	82.50*	6.00	5.08	1.32*	1.85*	0.87*	0.20	4.25*	9.33
GREENSTAR	55.00	5.50	5.54*	1.13*	1.59*	0.92*	0.14	3.78	9.32
ALTASWEDE	77.50*	6.00*	3.70	1.48*	1.86*	0.99*	0.39*	4.72*	8.42
ASTRED	80.00*	5.00	4.65	0.89	1.40	0.90*	0.09	3.27	7.92
START	80.00*	4.25	4.36	0.94	1.55	0.73	0.10	3.32	7.68
Experimental Varieties - Not Available for Farm Use									
KENLAND, FNDN	90.00*	8.50*	6.04*	1.49*	2.04*	1.27*	0.44*	5.25*	11.29*
KENLAND, BRDR	82.50*	7.75*	6.08*	1.30*	1.93*	1.13*	0.35*	4.70*	10.78*
WVPB-RC-A4	97.50*	7.25*	5.89*	1.21*	1.83*	1.07*	0.24	4.35*	10.24*
RS,C3-27	85.00*	5.75	5.09	1.43*	1.93*	1.20*	0.21	4.77*	9.87*
KY-NON-HAIRY	90.00*	6.50*	5.68*	0.98	1.55	0.98*	0.24	3.76	9.45
87-A	77.50	6.25*	5.51*	1.09*	1.65*	0.95*	0.21	3.89*	9.40
MEAN	81.30	6.50	5.41	1.23	1.80	1.02	0.27	4.27	9.67
CV,%	20.67	28.73	10.80	27.00	20.50	28.28	55.89	23.00	10.44
LSD,0.05	23.80	2.64	0.83	0.49	0.51	0.41	0.21	1.39	1.43

¹ 0 to 100 percent scale.

² 1 to 10 scale with 1 being weakest and 10 being most vigorous.

* Not significantly different from the highest numerical value in the column.

Table 3. Dry matter yields (tons/A) of red clover varieties sown 17 April 1996 at Lexington, KY as a part of the red clover breeding program.

Variety	1996 Total	1997 Harvests				1997 Total	2 yr Total
		Jun 6	Jul 16	Aug 26	Sep 25		
Commercial Varieties - Available for Farm Use							
Cinnamon	1.95*	1.94*	0.89*	0.23*	0.17*	3.23*	5.18*
Randolph	1.88*	1.83*	0.94*	0.19	0.18*	3.14*	5.03*
Ram	2.02*	1.73*	0.96*	0.16	0.16*	3.01*	5.03*
Freedom!	1.69*	1.88*	0.93*	0.28*	0.17*	3.27*	4.96*
Robust	2.04*	1.75*	0.82	0.16	0.13	2.87*	4.91*
GreenStar	1.88*	1.76*	0.89*	0.18	0.12	2.96*	4.84*
Wildcat	1.82*	2.03*	0.71	0.10	0.12	2.95*	4.78*
Renegade	2.10*	1.49	0.88*	0.16	0.13	2.66*	4.76*
RedGold	1.98*	1.57*	0.85	0.14	0.12	2.68*	4.66
Concorde	1.67*	1.76*	0.92*	0.12	0.11	2.82*	4.54
Scarlett	1.62*	1.78*	0.84	0.14	0.13	2.88*	4.50
Acclaim	1.88*	1.63*	0.59	0.08	0.09	2.40	4.28
Arlington	1.93*	1.28	0.73	0.03	0.10	2.14	4.07
Astred	1.46	1.00	0.15	0.03	0.06	1.24	2.70
Start	0.53	1.14	0.13	0.00	0.05	1.32	1.85
Experimental Varieties - Not Available for Farm Use							
Kenland,Brdr	1.98*	1.80*	1.11*	0.29*	0.21*	3.41*	5.40*
Kenstar,Brdr	2.10*	1.70*	0.82	0.17	0.13	2.82*	4.92*
WVP-RC-A4	1.92*	1.75*	0.71	0.12	0.13	2.71*	4.63
Mean	1.8	1.66	0.77	0.14	0.13	2.7	4.50
CV,%	20.9	21.8	22.2	45.7	31.3	17.7	15.2
LSD,0.05	0.54	0.51	0.24	0.09	0.06	0.97	0.68

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

Table 4. Dry matter yields (tons/A) of red clover varieties sown 12 April 1996 in Princeton, KY.							
Variety	% Stand Oct 30 1997	1996 Total	1997 Harvests			1997 Total	2 yr Total
			May 13	Jun 25	Sep 18		
Commercial Varieties - Available for Farm Use							
Common-O	65.0	2.29*	2.50*	1.74*	0.22*	4.45*	6.74*
Kenland,Certified	63.75	2.25*	2.46*	1.74*	0.25*	4.45*	6.7*
Randolph	73.75*	2.06*	2.44*	1.71*	0.19*	4.34*	6.39*
Common-P	67.50*	2.26*	2.18*	1.65*	0.24*	4.07*	6.32*
Cinnamon	68.75*	2.04*	2.47*	1.60*	0.17	4.24*	6.29*
Emarwan	66.25	2.10*	2.38*	1.49	0.15	4.02*	6.11*
Greenstar	45.0	2.13*	2.11*	1.60*	0.23*	3.93*	6.06*
Kenland,Uncertified	7.25	1.58	2.19*	1.65*	0.03	3.86*	5.44
Concorde	6.25	1.81	2.07*	1.49	0.03	3.59	5.4
Common-R	5.75	1.67	2.09*	1.53*	0.03	3.64	5.31
Common-Q	7.5	1.37	1.94	1.48	0.02	3.44	4.81
Altaswede	11.25	1.33	2.21*	1.18	0.01	3.4	4.73
Experimental Varieties - Not Available for Farm Use							
Kenland,Fndn	73.75*	2.33*	2.19*	1.69*	0.26*	4.14*	6.47*
Kenland,Brdr	82.50*	2.29*	2.30*	1.67*	0.22*	4.18*	6.47*
KyNon-hairy	88.75*	2.08*	2.40*	1.71*	0.20*	4.31*	6.4*
RC8501	61.25	2	2.41*	1.47	0.14	4.02*	6.02
RC-1	33.75	1.8	2.37*	1.61*	0.08	4.06*	5.86
Mean	48.71	1.96	2.28	1.59	0.15	4.01	5.97
CV,%	31.1	11.3	13.7	9.68	40	10.8	8.3
LSD,0.05	21.6	0.31	0.44	0.22	0.08	0.62	0.71
* Not significantly different from the highest numerical value in the column based on the 0.05 LSD.							

Table 5. Dry matter yields (tons/A) of red clover varieties sown 10 April 1997 in Princeton, KY.					
Variety	1997 Harvests				1997 Total
	Jun 25	Aug 6	Sep 18	Nov 20	
Commercial Varieties - Available for Farm Use					
Cinnamon	0.98*	0.84*	0.26*	0.15*	2.24*
Kenland	0.95*	0.80*	0.28*	0.15*	2.19*
Kenstar	0.81*	0.84*	0.25*	0.19*	2.08*
Wildcat	0.93*	0.73	0.24*	0.12	2.02*
Freedom!	0.83*	0.71	0.26*	0.18*	1.98
Redstart	0.90*	0.74	0.21	0.10	1.95
Greenstar	0.68	0.89*	0.22	0.10	1.88
Redgold	0.84*	0.72	0.20	0.11	1.87
Robust	0.78	0.80*	0.13	0.09	1.80
Common W	0.87*	0.57	0.16	0.07	1.66
Common V	0.66	0.58	0.16	0.05	1.44
Experimental Varieties - Not Available for Farm Use					
WVPB-A-4	1.01*	0.80*	0.28*	0.17*	2.25*
RC8702	0.93*	0.77	0.25*	0.13*	2.08*
WVPB-RC-91-200	0.94*	0.69	0.22	0.13*	1.98
FLA373	0.95*	0.57	0.11	0.11	1.73
G-27	0.56	0.61	0.10	0.04	1.32
MEAN	0.85	0.73	0.21	0.12	1.91
CV,%	17.14	11.26	18.89	33.7	8.75
LSD,0.05	0.21	0.12	0.06	0.06	0.24
* 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				Princeton		
		1996 ^{1,2}		1996 ³		1996 ²		1997 ²
		96 ⁴	97	96	97	96	97	97
Variety	Proprietor/KY Distributor							
Commercial Varieties - Available for Farm Use								
Acclaim	Allied Seed Coop./Scott Seed			*				
Altaswede	Farmer ecotype, Canada/Public							
Arlington	Wisconsin Agric. Exp. Sta./Public			*				
Astred								
Cinnamon	FFR/Southern States	*		*	*	*	*	*
Common O	Farmer ecotype/Public					*	*	
Common P	Farmer ecotype/Public					*	*	
Common Q	Farmer ecotype/Public							
Common R	Farmer ecotype/Public							
Common S	Farmer ecotype/Public		*					
Common T	Farmer ecotype/Public	*	*					
Common U	Farmer ecotype/Public	*	*					
Common V	Farmer ecotype/Public							
Common W	Farmer ecotype/Public							
Emarwan						*	*	
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							*
Ram	ABI			*	*			
Randolph	Allied Seed			*	*	*	*	
Red Gold	Production Services, McDaniel seeds/Turner Seed	*	*	*	*			
Redland/Concorde	ABI	*	*	*				
RedStart	Novartis							
Renegade	International Seeds/Green Seed			*	*			
Robust	Scott Seed/Sphar Seed	*	*	*	*			
Scarlett	Dairyland			*	*			
Start	Barenbrug USA/TFI							
Wildcat	Olsen-Fennell Seeds/Hansford Seed	*	*	*	*			*
Experimental Varieties - Not Available for Farm Use								
87-A	Northrup King	*	*					
Freedom! (Kentucky Non-Hairy)	KY Agric. Exp. Sta./Experimental	*		*	*	*	*	
FLA373								
G27	International Seeds							
Kenland, breeder seed	KY Agric. Exp. Sta./Experimental	*	*	*	*	*	*	
Kenland, foundation seed	KY Agric. Exp. Sta./Experimental	*	*			*	*	
Kenstar, breeder seed	KY Agric. Exp. Sta./Public			*	*			
RC-1	DLF/Experimental						*	
RC8501	Allied Seed/Experimental						*	
RC8702	FFR Cooperative							*
WVPB-A-4	Production Service International/Experimental	*	*	*	*			*
WVPB-RC-91-200	Western Production Inc/Experimental							
RS, C3 27, White clover	Whitetail Institute of America/Experimental		*					

¹ Establishment year
² Tests sown as part of The Forage Variety Testing Program
³ Tests sown as part of the Kentucky Red Clover Breeding Program
⁴ 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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