

The 1998 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 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 and Princeton are presented in Table 1. In general, the 1998 growing season was very wet initially and drier and warmer than average in the latter half.

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. In addition, breeder and foundation seed lots of Kenland were tested, and these results are listed separately under "Seed Increases."

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. Altaswede, 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-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

Table 1. Temperature and Rainfall at Lexington and Princeton in 1998.

MON	Lexington				Princeton			
	Temp		Rainfall		Temp		Rainfall	
	° F	DEP	IN	DEP	° F	DEP	IN	DEP
JAN	41	+10	3.96	+1.10	44	+10	2.95	-0.85
FEB	41	+6	2.54	-0.67	45	+7	3.43	-1.00
MAR	46	+2	3.40	-1.00	50	+3	2.29	-2.65
APR	54	-1	6.20	+2.32	59	-0	6.10	+1.30
MAY	67	+3	6.14	+1.67	72	+5	3.81	-1.15
JUN	73	+1	10.81	+7.15	77	+2	12.62	+8.77
JUL	75	-1	7.98	+2.98	80	+2	6.49	+2.20
AUG	76	+1	0.29	-3.64	78	+1	1.40	-2.61
SEP	74	+6	0.61	-2.59	77	+6	0.26	-3.07
OCT	58	+1	2.41	-0.16	63	+4	3.20	+0.15

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

Table 2. Dry Matter Yields (Tons/acre) and Stand Ratings of Red Clover Varieties Sown 17 April 1996 at Lexington, KY.

Variety	%Stand Jun 18 1998	1996 Total	1997 Total	1998 Harvests		1998 Total	3-yr Total
				May 6	Jun 18		
Commercial Varieties - Available for Farm Use							
Kenland, Certified	80.0 *	6.16 *	5.22 *	1.12 *	1.25 *	2.37 *	13.75 *
Robust	72.50 *	5.43 *	5.18 *	0.93 *	1.18 *	2.11 *	12.73 *
Common-U	72.50 *	6.09 *	4.69 *	0.83	0.98	1.80	12.59 *
Wildcat	60.00	5.62 *	5.02 *	0.75	1.08 *	1.83	12.47 *
Cinnamon	75.00 *	5.76 *	4.80 *	0.90	0.96	1.87	12.43 *
Greenstar	67.50	5.54 *	4.56	0.91	1.08 *	1.99	12.08 *
Common-T	22.50	5.79 *	4.10	0.63	1.07 *	1.71	11.60
Red Gold	35.00	5.62 *	4.32	0.75	0.81	1.56	11.49
Kenland, Uncertified	22.50	5.40 *	3.71	0.55	0.90	1.46	10.59
Common-S	37.50	5.08	3.53	0.65	0.96	1.60	10.21
Astred	12.50	4.65	2.95	0.69	0.79	1.48	9.08
Start	7.50	4.36	3.42	0.43	0.77	1.21	8.99
Concorde	17.50	4.58	2.75	0.60	0.80	1.41	8.74
Altaswede	15.00	3.70	3.53	0.47	0.91	1.38	8.61
Seed Increases - Not Available for Farm Use							
Kenland, FNDN	80.00 *	6.04 *	5.09 *	1.13 *	1.10 *	2.23 *	13.36 *
Kenland, BRDR	82.50 *	6.08 *	5.06 *	1.00 *	1.12 *	2.12 *	13.25 *
Experimental Varieties - Not Available for Farm Use							
Freedom!	85.00 *	5.68 *	5.37 *	1.03 *	1.19 *	2.22 *	13.27 *
WVPB-RC-A4	60.00	5.89 *	4.84 *	0.81	0.96	1.77	12.50 *
87-A	60.00	5.51 *	4.80 *	0.83	1.11 *	1.94	12.24 *
RS,C3-27	87.50 *	5.09	2.38	0.85	0.84	1.70	9.17
MEAN	52.63	5.41	4.27	0.80	0.99	1.79	11.46
CV,%	20.33	11.18	11.88	19.05	16.33	12.73	10.39
LSD,0.05	15.15	0.86	0.72	0.21	0.23	0.32	1.69

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

Table 3. Dry Matter Yields (Tons/acre) of Red Clover Varieties Sown 17 April 1996, at Lexington, Kentucky.								
Variety	% Stand Jul28 1998	1996 Total	1997 Total	1998 Harvests			1998 Total	3-yr Total
				May 15	Jun 26	Jul 31		
Commercial Varieties - Available for Farm Use								
Cinnamon	20.00	1.95 *	3.23 *	0.25	0.55 *	0.18 *	0.98*	6.16 *
GreenStar	17.50	1.88 *	2.96 *	0.27*	0.53 *	0.17	0.97 *	5.81 *
Ram	15.00	2.02 *	3.01 *	0.25	0.35	0.14	0.74	5.77 *
Randolph	17.50	1.88 *	3.14 *	0.24	0.35	0.11	0.70	5.73 *
Robust	11.25	2.04 *	2.87 *	0.12	0.14	0.06	0.32	5.22
Wildcat	8.75	1.82 *	2.95 *	0.09	0.12	0.07	0.28	5.06
Concorde	8.25	1.67 *	2.92 *	0.12	0.19	0.12	0.44	5.03
Renegade	4.75	2.10 *	2.66	0.10	0.12	0.03	0.24	5.01
RedGold	5.50	1.98 *	2.68	0.11	0.13	0.07	0.31	4.96
Scarlett	8.75	1.62 *	2.88 *	0.09	0.13	0.06	0.28	4.78
Acclaim	2.50	1.88 *	2.40	0.06	0.07	0.02	0.16	4.44
Arlington	0.50	1.93 *	2.14	0.09	0.09	0.01	0.19	4.26
Astred	1.25	1.46	1.24	0.01	0.07	0.03	0.20	2.90
Start	0.00	0.53	1.32	0.01	0.01	0.03	0.05	1.90
Seed Increases - Not Available for Farm Use								
Kenland, BRDR	36.25 *	1.98 *	3.41 *	0.38 *	0.64 *	0.28 *	1.31 *	6.70 *
Kenstar, BRDR	23.75	2.10 *	2.82 *	0.31 *	0.51 *	0.23 *	1.05 *	5.97 *
Experimental Varieties - Not Available for Farm Use								
Freedom!	40.00 *	1.69 *	3.27 *	0.36 *	0.58 *	0.27 *	1.21 *	6.16 *
WVPB-RC-A4	4.25	1.92 *	2.71	0.18	0.25	0.04	0.47	5.10
Mean	12.54	1.80	2.70	0.17	0.27	0.11	0.55	5.05
CV,%	70.67	20.95	17.52	50.88	45.56	73.89	45.92	13.83
LSD,0.05	12.58	0.54	0.67	0.13	0.17	0.11	0.36	0.99
* 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 12 April 1996 at Princeton, Kentucky.								
Variety	% Stand Mar 31 1998	% Stand Jul 17 1998	1996 Total	1997 Total	1998 Harvests		1998 Total	3-yr Total
					May 8	Jun 24		
Commercial Varieties - Available for Farm Use								
Kenland, certified	82.50 *	16.25	2.25 *	4.45 *	1.08 *	1.53 *	2.62 *	9.31 *
Common O	60.00	2.50	2.29 *	4.45 *	0.72	1.19	1.91	8.65 *
Cinnamon	70.00	12.50	2.04 *	4.24 *	0.94 *	1.26	2.20	8.48 *
Randolph	72.50	10.00	2.06 *	4.34 *	0.73	1.29	2.02	8.42
Common P	70.00	5.50	2.26 *	4.07 *	0.83	1.23	2.06	8.39
Emarwan	75.00	15.00	2.10 *	4.02 *	0.91	1.32	2.23	8.34
Greenstar	57.50	5.50	2.13 *	3.93 *	0.53	1.16	1.68	7.75
Kenland, uncertified	10.00	0.00	1.58	3.86 *	0.27	0.73	1.00	6.44
Concorde	12.50	0.00	1.81	3.59	0.32	0.69	1.01	6.41
Common R	10.00	0.00	1.67	3.64	0.28	0.77	1.06	6.37
Altaswede	7.50	0.00	1.33	3.40	0.37	0.79	1.16	5.89
Common Q	10.00	0.00	1.37	3.44	0.24	0.76	1.00	5.81
Seed Increases - Not Available for Farm Use								
Kenland, Fndn	85.00 *	28.75 *	2.33 *	4.14 *	1.09 *	1.59 *	2.68 *	9.15 *
Kenland, Brdr	90.00 *	27.50 *	2.29 *	4.18 *	1.09 *	1.55 *	2.64 *	9.11 *
Experimental Varieties - Not Available for Farm Use								
Freedom!	90.00 *	32.50 *	2.08 *	4.31 *	1.15 *	1.53 *	2.68 *	9.08 *
RC8501	70.00	4.25	2.00	4.02 *	0.83	1.14	1.97	7.99
RC-1	32.50	3.25	1.80	4.06 *	0.59	1.10	1.69	7.55
Mean	53.24	9.62	1.96	4.01	0.71	1.16	1.86	7.83
CV, %	17.71	54.39	11.28	10.84	21.14	10.72	10.59	7.62
LSD, 0.05	13.41	7.44	0.32	0.62	0.21	0.18	0.28	0.85

* 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 10 April 1997 at Princeton, Kentucky.							
Variety	% Stand Jul 16 1998	1997 Total	1998 Harvests			1998 Total	2-yr Total
			May 8	Jun 24	Jul 27		
Commercial Varieties - Available for Farm Use							
Kenland	93.50 *	2.19 *	1.82 *	2.09 *	0.55 *	4.46 *	6.65 *
Kenstar	87.50 *	2.08 *	1.54	1.97 *	0.53 *	4.05 *	6.13 *
Wildcat	80.00	2.02 *	1.99 *	1.78	0.38	4.15 *	6.17 *
Cinnamon	77.50	2.24 *	1.71	1.80	0.41 *	3.93	6.16 *
Redgold	61.25	1.87	1.85 *	1.73	0.28	3.86	5.73
Greenstar	60.00	1.88	1.49	1.91 *	0.38	3.78	5.67
Redstart	58.75	1.95	1.69	1.74	0.24	3.66	5.61
Robust	52.50	1.80	1.86 *	1.95 *	0.30	4.11 *	5.91
Common W	32.50	1.67	1.98 *	1.40	0.16	3.54	5.21
Common V	25.00	1.44	1.82 *	1.49	0.19	3.50	4.93
Experimental Varieties - Not Available for Farm Use							
Freedom !	91.25 *	1.98	1.90 *	2.13 *	0.49 *	4.51 *	6.49 *
RC8702	95.25 *	2.08 *	1.84 *	1.92 *	0.45 *	4.20 *	6.29 *
WVPB-RC-91-200	72.50	1.98	1.59	1.68	0.31	3.58	5.56
WVPB-A4	63.75	2.25 *	1.47	1.84	0.30	3.60	5.85
FLA373	32.50	1.73	1.42	1.12	0.14	2.68	4.41
G-27	28.75	1.32	2.13 *	1.07	0.10	3.31	4.63
Mean	63.28	1.91	1.76	1.73	0.33	3.81	5.71
CV, %	16.83	8.81	13.03	9.59	29.97	9.29	7.23
LSD, 0.05	15.17	0.24	0.33	0.24	0.14	0.50	0.59

* 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	
Variety	Proprietor/KY Distributor	96 ⁴	97	98	96	97	98	96	97	98	97	98
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	Mitsui Toatsu Chemicals, Inc.							*	*			
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/Turner Seed	*			*							
Redland III Brand/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	University of Florida											
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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