

2009 Red and White Clover Grazing Tolerance Report

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Introduction

Red clover (*Trifolium pratense*) and white clover (*Trifolium repens*) are both high-quality forage legumes that are used primarily in mixed stands with tall fescue or orchardgrass for improving yield and quality of pastures. Stands of improved red clover are generally productive for two to three years; white clover can be productive for three to four years. Their high palatability causes them to be overgrazed easily. Red clover is not persistent under heavy, close grazing, but white clover is tolerant to close grazing. Three types of white clover grow in Kentucky: Dutch, intermediate and ladino. The intermediate type has been developed to persist better than the ladino type under pasture or continuous grazing conditions. Ladino white clover has larger leaves and taller growth than the intermediate and Dutch types.

This report summarizes current research on the grazing tolerance of clover varieties when subjected to continuous grazing pressure. Table 8 shows a summary of all white clover varieties tested in Kentucky during the last eight years. Go to the UK Forage Extension website at www.uky.edu/Ag/Forage to obtain electronic versions of all forage variety testing reports from Kentucky and surrounding states and a large number of other forage publications.

Description of the Tests

Red and white clover tests for grazing were established in Lexington in the fall of 2007 and 2008. Soils at the test site are well-drained silt loams and are well suited to clover production. Plots were 5 by 15 feet in a randomized complete block design with each variety replicated six times.

Red clover was seeded at the rate of 12 lb/A and white clover at 3 lb/A into a prepared seedbed using a disk drill. All seed lots were inoculated prior to planting. Plots were grazed continuously beginning the spring after fall seeding. In general, plots were grazed from mid-April to mid-September to a height of 1 to 3 inches. Supplemental hay was fed during periods of slowest growth.

Visual ratings of percent stand were made in the fall several weeks after the cattle were removed to check stand survival after the grazing season. Ratings were made in the spring prior to grazing to check on winter survival and spring growth. Since trials were seeded in rows, persistence ratings were based on density within a row and not on total ground cover. Fertilizers (lime, P, K, and Boron) were applied according to University of Kentucky recommendations.

Results and Discussion

Weather data for Lexington for 2007, 2008 and 2009 are presented in Table 1.

Data on percent stand are presented in Tables 2 through 5. Statistical analy-

ses were performed on these data to determine if the apparent differences are truly due to variety or just due to chance. Varieties not significantly different from the highest numerical value in a column are marked with one asterisk (*). To determine if two varieties are truly different, compare the difference between the two varieties to 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.

There were differences in persistence between white versus red clover. Red clover entries did not tolerate continuous, heavy grazing (Table 2). In contrast, several white clover entries persisted into the second season under the abusive grazing of these trials. Tables 6 and 7 summarize information about distributors and persistence across years.

Table 1. Temperature and rainfall at Lexington, Kentucky in 2007, 2008 and 2009.

	2007				2008				2009 ²			
	Temperature		Rainfall		Temperature		Rainfall		Temperature		Rainfall	
	°F	DEP ¹	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	37	+6	2.93	+0.07	32	+2	3.91	+1.05	29	-2	4.32	+1.46
FEB	27	-8	1.83	-1.38	36	+1	6.11	+2.90	38	+3	2.53	-.068
MAR	52	+8	1.97	-2.43	44	+1	6.51	+1.91	48	+4	2.39	-2.01
APR	53	-2	3.87	-0.01	55	0	5.89	+2.01	56	+1	4.79	+0.91
MAY	68	+4	1.45	-3.02	62	-2	4.33	+0.14	65	+1	6.04	+1.57
JUN	74	+2	1.77	-1.89	74	+2	3.59	-0.07	74	+2	5.19	+1.53
JUL	74	-2	6.90	+1.90	76	0	3.41	-1.59	72	-4	7.57	+2.57
AUG	80	+5	2.56	-1.37	75	0	2.18	-1.75	73	-2	4.53	+0.60
SEP	72	+4	1.15	-2.05	72	+4	1.42	-1.78	69	+1	5.90	+2.70
OCT	63	+6	5.28	+2.71	57	0	1.53	-1.04	53	-4	5.77	+3.20
NOV	46	+1	2.86	-0.53	43	-2	2.53	-0.86				
DEC	40	+4	5.29	+1.31	35	-1	6.03	+2.05				
Total			37.86	-6.69			47.24	+2.69			49.03	+11.85

¹ DEP is departure from the long-term average.
² 2009 data is for ten months through October.

Table 8 is a summary of stand persistence data from 2002 to 2009 of commercial white clover varieties that have been entered in the Kentucky trials. The data is listed as a percentage of the mean of the commercial varieties entered in each specific trial. In other words, the mean for each trial is 100 percent—varieties with percentages over 100 persisted better than average, and varieties with percentages less than 100 persisted less than average. Direct, statistical comparisons of varieties cannot be made using the summary Table 8, but these comparisons do help to identify varieties for further consideration. Varieties that have performed better than average over many years have very stable performance; others may have performed very well in wet years or on particular soil types. These details may influence variety choice, and the information can be found in the yearly reports. See footnote in Table 8 to determine which yearly report to refer to.

Summary

Although these varieties were abused during the growing season, they were allowed to rest and regrow after September 15 to prepare for winter. Research has shown that abusive grazing tests are a good way to sort out differences in grazing tolerance between varieties in a relatively short period of time.

This information should be used along with yield and pest resistance information in selecting the best clover variety for each individual use. It is not recommended that clover be continuously grazed as was done in this trial. While several varieties expressed tolerance to the level of grazing pressure used in these trials, overgrazing greatly reduces yield and therefore profitability of these clovers.

Good management for maximum life from grazing clover would include:

- Allowing clover to become completely established before grazing.

- Using rotational grazing where animals harvest available forage in seven days or less, followed by resting for 28 days before regrazing. Less time is required for white clover.
- Adding any needed fertilizer and lime.
- Removing grazing livestock from clover fields from mid-September to November 1 to replenish root reserves for winter survival. This is especially important with red clover.

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Table 2. Seedling vigor and stand persistence of red clover varieties sown September 5, 2007 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 25, 2007	Percent Stand				
		2007		2008		2009
		Oct 25	Apr 9	Oct 17	Apr 8	Oct 12
Commercial Varieties—Available for Farm Use						
Cinnamon Plus	4.0	63	55	34	12	8*
Common O	4.5	90	93	48	30	8*
Kenland	3.1	48	51	28	19	8*
Joliet	4.3	69	71	27	17	6*
Experimental Varieties						
GAC1RC	2.7	47	43	39	18	11*
Mean	3.6	59.5	57.7	33.4	17.6	8.2
CV,%	19.6	36.8	38.5	39.8	59.1	52.7
LSD,0.05	1.0	31.7	32.2	19.6	15.4	6.2

¹ Vigor score based on a score of 1 to 5 with 5 being the most vigorous seedling growth.
 * Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 3. Seedling vigor and stand persistence of red clover varieties sown September 10, 2008 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 13, 2008	Percent Stand		
		2008		2009
		Oct 13	Apr 8	Oct 12
Commercial Varieties—Available for Farm Use				
Cinnamon Plus	3.2	100	99	86*
Freedom!	4.0	100	99	81
Kenland	3.2	99	100	81
Common O	4.0	100	100	71
Juliet	3.5	98	100	70
Experimental Varieties				
B7-1865	3.3	100	100	95*
CW 0400040	3.8	99	99	88*
CW 202	3.2	98	100	86*
GA-100(RC)	3.0	99	100	86*
GA-9908	2.5	98	99	84*
Mean	3.4	99.2	99.6	82.7
CV,%	29.3	2.2	1.2	11.6
LSD,0.05	1.1	2.5	1.4	11.1

¹ Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
 * Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 4. Stand persistence of white clover varieties sown April 8, 2008 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Percent Stand			
	2008		2009	
	Jul 17	Oct 17	Apr 8	Oct 12
Commercial Varieties—Available for Farm Use				
Will	95	95	90	87*
Ivory II	94	92	87	84*
RegalGraze	95	92	83	77*
Kopu II	92	87	73	70
Seminole	94	91	81	68
Experimental Varieties				
GO-ABC	97	95	86	79*
GO-HSM	89	84	73	73
GO-AJ	94	89	83	62
GO-BSG	90	85	59	49
Mean	93.3	89.8	79.5	72.0
CV,%	6.4	7.6	13.0	15.0
LSD,0.05	6.9	7.9	12.1	12.6

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

Table 5. Seedling vigor and stand persistence of white clover varieties sown September 10, 2008 in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 13, 2008	Percent Stand		
		2008	2009	
		Oct 13	Apr 8	Oct 12
Commercial Varieties—Available for Farm Use				
Durara	2.0	95	96	100*
Will	2.2	96	97	100*
Patriot	2.0	94	95	99*
Rampart	2.0	95	94	99*
Regal	4.0	99	99	99*
RegalGraze	3.0	98	100	98
Experimental Varieties				
Ky Select	3.2	98	100	100*
CW 0401	4.2	98	99	96
Mean	2.8	96.6	97.4	98.8
CV,%	31.4	3.3	2.7	1.6
LSD,0.05	1.0	3.7	3.1	1.9

¹ Vigor score based on a scale of 1 to 5 with 5 being the most vigorous seedling growth.
* Not significantly different from the highest numerical value in the column, based on the 0.05 LSD.

Table 6. Summary of persistence of red clover varieties under heavy grazing pressure across years at Lexington, Kentucky.

Variety	Proprietor/KY Distributor	2007 ¹				2008	
		Apr	Oct	Apr	Oct	Apr	Oct
		2008 ²		2009		2009	
Commercial Varieties—Available for Farm Use							
Cinnamon Plus	FFR/Southern States	x ³	*	x	*	*	*
Common O	Public	*	*	*	*	*	x
Freedom!	Barenbrug USA					*	x
Juliet	Caudill Seed	*	x	*	*	*	x
Kenland (certified)	Public	x	x	*	*	*	x
Experimental Varieties							
B7-1865	Blue Moon Farms					*	*
CW 0400040	Cal/West					*	*
CW 202	Cal/West					*	*
GAC1RC	University of Georgia	x	*	*	*		
GA-100(RC)	University of Georgia					*	*
GA09908	University of Georgia					*	*

¹ Establishment year.
² Date of rating of percent stand.
³ X in the block indicates the variety was in the test but the stand survival was significantly less than the most persistent red clover variety. An open block indicates the variety was not in the test.
* Not significantly different from the most persistent red clover variety.

Table 7. Summary of persistence of white clover varieties under heavy grazing pressure across years at Lexington, Kentucky.

Variety	Type	Proprietor/KY Distributor	2007 ¹				2008	
			Jul	Oct	Apr	Oct	Apr	Oct
			2008 ²		2009		2009	
Commercial Varieties—Available for Farm Use								
Durana	Intermediate	Pennington Seed					*	*
Ivory II	Intermediate	DLF International	*	*	*	*		
Kopu II	Intermediate	Ampac Seed	*	x ³	x	x		
Patriot	Intermediate	Pennington Seed					x	*
Rampart	--	Oregro Seeds					x	*
Regal	Ladino	Public					*	*
RegalGraze	Ladino	Cal/West Seeds	*	*	*	*	*	x
Seminole	Ladino	Saddle Butte Ag, Inc	*	*	*	x		
Will	Ladino	Allied Seed	*	*	*	*	*	*
Experimental Varieties								
CW 0401	Ladino	Cal/West Seeds					*	x
GO-ABC	Intermediate	Grassland Oregon	*	*	*	*		
GO-AJ	Intermediate	Grassland Oregon	*	*	*	x		
GO-BSG	Intermediate	Grassland Oregon	*	x	x	x		
GO-HSM	Intermediate	Grassland Oregon	*	x	x	x		
KY Select	Intermediate	KY Agric. Exper. Station					*	*

¹ Establishment year.

² Date of rating of percent stand.

³ X in the block indicates the variety was in the test but the stand survival was significantly less than the most persistent white clover variety. An open block indicates the variety was not in the test.

* Not significantly different from the most persistent white clover variety.

Table 8. Summary of Kentucky White Clover Grazing trials 2002-2009 (stand persistence shown as a percent of the mean of the commercial varieties in the test).

Variety	Type	Proprietor	2002 ^{1,2}	2004	2006 ³	2006	2008 ⁴	Mean ⁵ (#trials)
			2yr ⁶	4yr	2yr	2yr	2yr	
Alice	Intermediate	Barenbrug USA		59	98			79(2)
Barblanca	Intermediate	Barenbrug USA		118	91	151		120(3)
Colt	Intermediate	Seed Research of OR		114	134	122		123(3)
Crescendo	Ladino	Cal/West	84			72		78(2)
Durana	Intermediate	Pennington		83	105	103	101	98(4)
Insight	Ladino	Allied Seed				77		-
Ivory	Intermediate	Cebeco	132	142				137(2)
Kopu II	Intermediate	Ampac Seed			77	122		100(2)
Patriot	Intermediate	Pennington		110	137	122	101	118(4)
Rampart	--	Oregro Seeds					100	-
Regal	Ladino	Public	92		57	54	100	76(4)
RegalGraze	Ladino	Cal/West			84	87	99	90(3)
Resolute	Intermediate	FFR/Southern States			101	106		104(2)
Seminole	Ladino	Saddle Butte Ag. Inc.		75		97		86(2)
Tillman II	Ladino	Caudill Seed	92					-
Will	Ladino	Allied Seed			117	87	101	102(3)

¹ Year trial was established.

² Use this summary table as a guide in making variety decisions, but refer to specific yearly reports to determine statistical differences in stand persistence between varieties. To find actual persistence ratings, look in the yearly report for the final year of each specific test. For example, the trial planted in 2002 was grazed for 2 years so the final persistence report would be "2004 Red and White Clover Grazing Tolerance Report" archived in the KY Forage website at <www.uky.edu/Ag/Forage>.

³ This trial was replanted in the spring of 2006 due to poor establishment in the fall of 2005.

⁴ This trial was replanted in the spring of 2008 due to poor establishment in the fall of 2007.

⁵ Mean only presented when respective variety was included in two or more trials.

⁶ Number of years of data.



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