



2020 Red and White Clover Grazing Tolerance Report

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Introduction

Red clover (*Trifolium pratense L.*) is a high-quality, short-lived perennial legume that is used in mixed or pure stands for pasture, hay, silage, soil improvement, and wildlife habitat. This species is adapted to a wide range of climatic and soil conditions. Stands of improved varieties are generally productive for two and a half to 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.

White clover (*Trifolium repens L.*) is a low-growing, perennial pasture legume with white flowers. It differs from red clover in that the stems (stolons) grow along the surface of the soil and can form adventitious roots that may lead to the development of new plants. Three types of white clover grow in Kentucky: Dutch, intermediate, and ladino. Dutch white clover, sometimes called common, naturally occurs in many Kentucky pastures and even lawns. It is generally long lived and reseeds readily, but its small leaves

and low growth habit result in low forage yield. The intermediate type is a cross between ladino and Dutch white clover and has been developed to give higher yields than the Dutch type and to persist better than the ladino type under pasture or frequent grazing conditions. Ladino white clover has larger leaves and taller growth than the intermediate and Dutch types and is the highest yielding of the three white clover types.

This report summarizes research on the grazing tolerance of clover varieties when subjected to continuous grazing pressure. Go to the UK Forage Extension website at www.forages.ca.uky.edu to obtain electronic versions of all forage variety testing reports from Kentucky and surrounding states and a large number of other forage publications.

Important Selection Considerations

Local adaptation and persistence. Select a variety that is adapted to Kentucky as indicated by superior performance across years and locations in replicated trials such as those reported in this publication. Grazing persistence data should be used in combination with yield data to select

the best variety for pasture use. White clover generally persists longer than red clover, particularly in wet seasons, and has the ability to reseed even under grazing. Refer to the 2020 Red and White Clover Report (PR-782), or previous years if needed, for yield data on specific varieties of interest.

Seed quality. Buy premium-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 those reported in this publication. Other information on the label will include the test date (which must be within the previous nine months), the level of germination, and the percentage of other crop and weed seed. Order seed well in advance of planting time to ensure that it will be available when needed.

Description of the Tests

Tests in this report were established in Lexington for red clover (fall of 2018 and spring of 2020) and white clover (fall of 2016, 2017, and 2018 and spring of 2020). Soils at the test site are well-drained silt loams and are well suited to clover

Table 1. Temperature and rainfall at Lexington, Kentucky, in 2017, 2018, 2019, and 2020.

	2017				2018				2019				2020 ²			
	Temp		Rainfall		Temp		Rainfall		Temp		Rainfall		Temp		Rainfall	
	°F	DEP ¹	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP	°F	DEP	IN	DEP
JAN	40	+9	6.81	+3.95	31	0	2.01	-0.85	33	+2	4.11	+1.25	40	+9	3.72	+0.86
FEB	47	+12	4.46	+1.25	45	+10	9.77	+6.56	42	+7	7.64	+4.43	38	+3	5.14	+1.93
MAR	48	+4	3.34	-1.06	42	-2	5.16	+0.76	43	-1	3.49	-0.91	51	+7	3.79	-0.61
APR	62	+7	4.17	+0.29	50	-5	5.52	+1.64	54	+4	4.76	+0.88	52	-3	4.92	+1.04
MAY	66	+2	7.74	+3.27	73	+9	8.39	+3.92	69	+5	4.49	+0.02	62	-2	5.69	+1.22
JUN	73	+1	7.68	+4.02	76	+4	6.42	+2.76	73	+1	6.13	+2.47	72	0	2.56	-1.1
JUL	76	0	4.49	-0.51	77	+1	6.15	+1.15	79	+3	3.30	-1.70	79	+3	3.23	-1.77
AUG	74	-1	6.66	+2.73	77	+2	6.45	+2.52	77	+2	2.42	-1.51	75	0	3.41	-0.52
SEP	69	+1	4.72	+1.52	74	+6	12.88	+9.68	77	+9	0.18	-3.02	68	0	4.43	-0.83
OCT	60	+3	6.06	+3.49	59	+2	6.54	+3.97	61	+4	7.55	+5.58	57	0	4.98	+2.41
NOV	47	+2	3.09	-0.30	42	-3	5.64	+2.25	41	-4	5.39	+2.00				
DEC	35	-1	2.66	-1.32	40	+4	7.35	+3.37	43	+7	5.74	+1.76				
Total			61.88	+17.33			82.28	+37.73			55.20	+10.65			41.47	+4.29

¹ DEP is departure from the long-term average.

² 2020 data is for ten months through October.

production. Plots were 5 feet by 15 feet in a randomized complete block design with each variety replicated six times.

Red clover was seeded at the rate of 12 pounds per acre and white clover at 3 pounds per acre 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-May to mid-September to a height of 1 to 3 inches. For spring seeded trials, grazing was started in early July. 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. Ratings were made in the spring prior to resuming grazing to assess 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.

Table 3. Stand persistence of red clover varieties sown April 3, 2020, in a cattle grazing tolerance study at Lexington, Kentucky.¹

Variety	Percent Stand	
	2020	
	Jun 5	Sep 30
Commercial Varieties-Available for Farm Use		
SS0303RCG	85	84*
Barduro	86	82*
Freedom!	85	81*
GA9908	80	80*
Kenland (certified)	83	71
Gallant	73	70
Experimental Varieties		
BARTP9	90	90*
BARTP11	83	84*
Mean	82	80
CV,%	14	16
LSD,0.05	14	15

¹ This study was originally seeded September 5, 2019, but entire stand was killed by sclerotinia, therefore it was reseeded April 3, 2020.

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

Table 2. Seedling vigor and stand persistence of red clover varieties sown September 5, 2018, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Sep 28, 2018	Percent Stand				
		2018		2019		2020
		Sep 28	Mar 28	Nov 5	Mar 19	Oct 13
Commercial Varieties-Available for Farm Use						
Barduro	4.5	97	89	19	8	6*
Gallant	3.7	98	94	28	16	5*
Common O	4.6	96	98	12	3	4*
Freedom! MR	4.8	99	97	25	12	4*
Kenland	4.3	96	92	23	12	4*
Freedom!	4.5	99	95	30	18	3*
CW9901	4.8	99	96	22	7	3*
SS0303RCG	4.4	98	97	10	6	2*
Mean	4.4	98	95	22	11	4
CV,%	10.4	3	4	66	73	81
LSD,0.05	0.7	4	5	20	11	4

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. Seedling vigor and stand persistence of white clover varieties sown September 8, 2016, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 4, 2016	Percent Stand									
		2016		2017		2018		2019		2020	
		Oct 4	Mar 15	Oct 11	Mar 16	Sep 26	Mar 28	Nov 5	Mar 25	Oct 13	
Commercial Varieties-Available for Farm Use											
Will	4.5	100	98	94	94	94	88	48	43	32*	
Kopu II	4.8	100	89	94	94	92	68	42	40	30*	
Patriot	3.6	97	97	98	98	97	88	43	43	30*	
RegalGraze	5.0	100	95	90	88	83	80	43	38	30*	
Durana	3.5	97	95	97	97	99	80	47	43	24*	
Alice	3.5	96	94	95	94	87	62	40	37	22	
Mean	4.2	98	95	95	94	92	78	44	41	28	
CV,%	11.0	2	2	4	4	5	16	35	60	29	
LSD,0.05	0.5	2	3	4	4	6	15	18	15	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 5. Seedling vigor and stand persistence of white clover varieties sown September 9, 2017, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Oct 11, 2017	Percent Stand							
		2017		2018		2019		2020	
		Oct 11	Mar 14	Sep 26	Mar 28	Nov 5	Mar 25	Oct 13	
Commercial Varieties-Available for Farm Use									
Patriot	3.2	95	95	96	95	50	45	77*	
Renovation	3.6	96	95	96	95	40	33	75*	
Durana	3.8	97	97	97	96	38	35	73*	
Will	4.3	97	98	95	94	50	52	73*	
RegalGraze	4.8	99	99	92	92	38	37	71*	
Kakariki	4.7	99	98	97	95	48	37	65*	
Alice	3.9	96	96	97	95	42	43	63	
Experimental Varieties									
NFWC04-29	3.7	97	97	95	95	52	47	68*	
Mean	4.0	97	97	95	94	45	41	71	
CV,%	18.5	2	2	3	3	38	36	15	
LSD,0.05	0.9	2	2	4	3	20	17	13	

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.

Results and Discussion

Weather data for Lexington is presented in Table 1. Data on percent stand are presented in Tables 2 through 7. Statistical analyses were performed on these data to determine if the apparent differences are truly due to variety or just due to chance. 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.

Tables 8 and 9 show information about distributors for all red and white clover varieties included in these tests. Table 10 is a summary of stand persistence data from 2002 to 2020 of commercial white clover varieties that have been entered in the Kentucky trials. Due to minimal stands remaining after two years of grazing, a summary table for red clover is not included in this report. The data are listed as a percentage of the mean of the commercial varieties entered in each specific trial. In other words, the mean value for each trial is set at 100 percent—varieties

Table 6. Seedling vigor and stand persistence of white clover varieties sown September 5, 2018, in a cattle grazing tolerance study at Lexington, Kentucky.

Variety	Seedling Vigor ¹ Sep 28, 2018	Percent Stand				
		2018	2019		2020	
		Sep 28	Mar 28	Nov 5	Mar 25	Oct 13
Commercial Varieties-Available for Farm Use						
Will	3.9	93	88	87	80	78*
Patriot	2.8	79	62	70	60	68*
Alice	3.8	93	64	79	66	62
RegalGraze	4.1	96	89	78	53	62
Kopu II	3.5	93	55	63	47	58
Durana	2.5	84	67	75	55	52
Mean	3.4	90	71	75	60	63
CV,%	17.1	9	15	20	23	22
LSD,0.05	0.7	10	13	18	17	16

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.

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 Table 10 summary, but these comparisons can 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 more information can be found in the yearly reports. See the footnote in Table 10 to determine the yearly report that should be referenced. Due to minimal stands remaining after two years of grazing, a summary table for red clover is not included in this report.

Summary

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. It should be noted that although these varieties were abused during the growing season, they were allowed to rest and regrow after September 15 to prepare for winter. This information should be used along with yield and pest resistance information in selecting the best clover variety for each situation.

For best results, clover should not be continuously grazed as was done in this trial. Even though, several varieties tolerated the level of grazing pressure used in these trials, overgrazing greatly reduces yield and therefore profitability of these clovers.

Table 7. Stand persistence of white clover varieties sown April 3, 2020, in a cattle grazing tolerance study at Lexington, Kentucky.¹

Variety	Percent Stand	
	2020	
	Jun 5	Sep 30
Commercial Varieties-Available for Farm Use		
Renovation	38	88*
Neches	45	83*
Will	38	82*
Durana	30	81*
Kopu II	33	78*
Alice	43	78*
RegalGraze	39	74
Patriot	20	68
Mean	36	79
CV,%	47	11
LSD,0.05	20	11

¹ This study was originally seeded September 5, 2019, but entire stand was killed by sclerotinia, therefore it was reseeded April 3, 2020.

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

Table 8. Proprietors of red clover varieties in current grazing trials in Kentucky.

Variety	Proprietor/KY Distributor
Commercial Varieties-Available for Farm Use	
Barduro	Barenbrug USA
Common O	Public
CW9901	Barenbrug USA
Freedom!	Barenbrug USA
Gallant	Turner Seed
Kenland (certified)	Public
SS-0303RCG	Southern States
Experimental Varieties¹	
BARTP9	Barenbrug USA
BARTP11	Barenbrug USA

¹ Experimental varieties are not available commercially, but provide an indication of the progress being made by forage breeding companies.

Table 9. Proprietors and clover type of white clover varieties in current grazing trials in Kentucky.

Variety	Type	Proprietor/KY Distributor
Commercial Varieties-Available for Farm Use		
Alice	Intermediate	Barenbrug
Durana	Intermediate	Pennington Seed
Kakariki	Ladino	Luisetti Seeds
Kopu II	Intermediate	Ampac Seed
Patriot	Intermediate	Pennington Seed
Neches	Intermediate	Barenbrug
Regal Graze	Ladino	Cal/West Seeds
Renovation	Intermediate	Smith Seed
Will	Ladino	Allied Seed
Experimental Varieties¹		
NFWC04-29	Intermediate	Noble Foundation

¹ Experimental varieties are not available commercially, but provide an indication of the progress being made by forage breeding companies.

