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Freedom! Red Clover—A New Variety for Kentucky

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Freedom! is a new variety of red clover developed by the Kentucky Agricultural Experiment Station and released in 2001. It is a medium red clover variety adapted to the same general region as Kenland, i.e., Kentucky and the central clover region of the United States.

Freedom!—so named because of its freedom from pubescence (non-glandular hairs)—was developed to permit faster drying and to reduce dustiness of hay. It is especially recommended for hay because it is less dusty than other varieties. Less dustiness should result in improved air quality that may be associated with reduced health hazard for both humans and livestock.

Plants of the Kenland variety were subjected to five cycles of selection for low numbers of hairs on stems starting in 1992. By 1996, the average number of hairs per square millimeter on Freedom! stems at Lexington was 5.02 compared to Kenland with 7.71. Comparable figures for plants grown in Princeton were 3.39 and 8.18, respectively. Other U.S. varieties are comparable to Kenland in amount of pubescence. After testing, Freedom! was released on an exclusive basis to Barenbrug USA, located in Tangent, Oregon. First seed sales were expected in early 2003.

Drying Characteristics of Freedom!

In 1995, mechanically conditioned field-cured hay of Freedom! had a drying rate during the first day of 22.5% per hour compared with a slower rate of 17.7% per hour for conditioned Kenland. In 1996, mechanically conditioned Freedom! dried at a rate of 18.2% compared to 15.7% for conditioned Kenland hay. Unconditioned hay of the same varieties dried at rates of 14.0 and 13.1%, respectively. Actual moisture percentages for Freedom!, Kenland, and Cimarron alfalfa are shown in Table 1. It is apparent that the reduced hairiness of Freedom! allows faster drying and earlier harvesting, thus avoiding possible loss of quality due to rainfall.

Table 1. Drying characteristics of red clover and alfalfa.

Variety	Conditioning	Initial	Day 2	Day 3
		---------- % Moisture ----------		
Freedom!	Cond.	73.6	24.3	15.1
	Not cond.	73.9	33.2	20.4
Kenland	Cond.	74.2	26.6	17.5
	Not cond.	74.7	34.1	22.6
Cimarron	Cond.	68.1	18.3	10.7
Alfalfa	Not cond.	67.0	17.5	11.9
	LSD, 5%	1.1	4.5	3.4

Dust Characteristics of Freedom!

Dustiness of Freedom! and Kenland hays were compared using dry sieves ranging from large to very small openings. Freedom! had 53% less dust passing through the smallest sieve than did Kenland (Table 2). Much of the dust is caused by hairs that break off from the stems during curing and harvesting processes.

Table 2. Dustiness of Freedom! and Kenland red clover hay.

Variety	<0.150 mm pubescence	<0.045 mm dust
	---------- % dry matter ----------	
Freedom!	0.60	0.042
Kenland	0.99	0.090
Prob. >F	0.001	0.005

Figure 1A.
Kenland stem

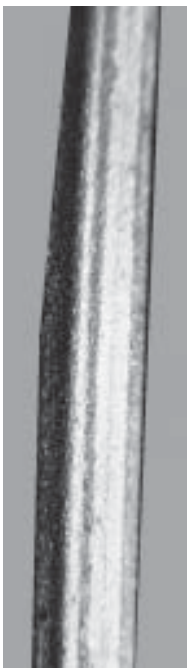

Figure 1B.
Freedom! stem

Figure 1. Comparison of stems of Kenland (A) and Freedom! (B) showing difference in number of hairs on stems.

Hay Yield of Freedom!

Yield of Freedom! was compared with other varieties for three years at Princeton and Quicksand, Kentucky. At both locations, yield of Freedom! was not significantly different from Kenland, its parent variety. It was significantly higher yielding than other varieties included in these trials (Table 3). It is apparent that the breeding program to remove pubescence from Freedom! did not reduce yield or overall general adaptation to Kentucky conditions. Freedom! can be expected to produce high hay yields throughout the state.

Table 3. Dry matter yield of red clover varieties at Princeton (1996-1998) and Quicksand (1998 – 2000).

Princeton		Quicksand	
	3-year total yield		3-year total yield
Variety	**T/A**	**Variety**	**T/A**
Altaswede	5.89	Kenland Uncert.	7.30
Cinnamon	8.48*	Kenstar	10.12*
Common – O	8.65*	**Freedom!**	10.26*
Common – P	8.39	Cinnamon	9.45
Common – Q	5.81	Common – X	6.92
Common – R	6.37	Common – Y	7.53
Concorde	6.41	Syn 3-92	7.55
Emarwan	8.34	Greenstar	9.39
Freedom!	9.08*	Common – Z	6.83
Green Star	7.75	ZR9701R	9.14
Kenland Cert.	9.31*	Kenland Cert.	10.59*
Kenland Uncert.	6.44	Solid	8.82
Randolph	8.42	RC8702	9.89*

* Not significantly different at LSD 0.05.

Seed Yield of Freedom!

Seed yield of Freedom! was compared over a two-year period with Kenland and other Kentucky-developed varieties and experimentals at Lexington. Freedom! seed yields, although slightly lower than Kenland, were not significantly different (Table 4). These data suggest that Freedom! should produce excellent seed yields in Kentucky. It is also likely that seed yields will be at least adequate in Oregon where Kenland is an excellent seed producer.

Table 4. Seed yield of red clover varieties at Lexington in 1999 and 2000.

	Seed Yield (lbs/acre)	
Variety	**1999**	**2000**
Freedom!	318 c*	266 abc
Kenland	338 c	306 a
Kenstar	347 bc	253 abc
KNARS (KY)	351 abc	243 bc
KNARS (OR)	359 ab	246 bc
KVMRS	326 c	213 c
Low Phenolic	383 a	283 ab

* Means with the same letter not significantly different, P = 0.05.

Leafhopper Resistance of Freedom!

Leafhopper resistance of Freedom! was compared with Kenland and other varieties of red clover over a three-year period at Lexington and Princeton. Lower scores indicate greater resistance. Freedom! was slightly more susceptible than more pubescent varieties at both locations. However, it was not as susceptible as the introduced varieties Start and Astred and was not different from Kenland at Princeton (Table 5). Lack of hairs on Freedom! apparently is not associated with undue susceptibility to leafhoppers.

Table 5. Leafhopper resistance of red clover varieties at Lexington and Princeton, 1997 and 1999.

Lexington		Princeton	
Variety	**Score†**	**Variety**	**Score†**
Acclaim	3.3 efg	Belle	3.8 de
Arlington	3.5 def	Solid	5.0 c
Astred	9.0 a	RedlanGraze	3.0 e
Cinnamon	3.8 de	Kenland	4.3 cd
Concorde	2.5 gh	Royal Red	8.5 a
Freedom!	5.8 b	Mammoth	6.8 b
Green Star	2.8 fgh	**Freedom!**	4.3 cd
Kenland	4.3 cd	Plus	3.8 de
Kenstar	3.5 def	Cinnamon	3.8 e
Ram	2.3 h		
Randolph	2.8 fgh		
Red Gold	3.5 def		
Renegade	5.0 bc		
Robust	3.0 e-h		
Scarlett	2.3 fg*		
Start	9.0 a		
Wildcat	3.0 e-h		

* Means with the same letter not significantly different, P = .05.

† 1 = most to 9 = least resistance.

Stem Diameter of Freedom!

Stem diameter of Freedom! was compared with Kenland and other varieties at Lexington and Princeton in 1997 and 1999. Stems of Freedom! were about the same width as those of Kenland and most other varieties (Table 6). These data indicate that the selection for fewer hairs had no effect on stem diameter. The faster drying of Freedom! cannot be attributed to smaller stems but is associated with fewer hairs.

Table 6. Stem diameter of red clover varieties at Lexington and Princeton.

Lexington, 1997		Princeton, 1999	
Variety	**Diameter (mm)**	**Variety**	**Diameter (mm)**
Acclaim	2.69 efg	Belle	3.31 a
Arlington	2.62 g	Solid	3.23 a
Astred	2.75 a-g	RedlanGraze	2.78 a
Cinnamon	2.79 a-f	Kenland	3.24 a
Concorde	2.70 efg	Royal Red	3.09 a
Freedom!	2.84 a-e	Mammoth	3.27 a
Green Star	2.85 abc	**Freedom!**	3.26 a
Kenland	2.88 a	Plus	3.35 a
Kenstar	2.70 efg	Cinnamon	3.21 a
Ram	2.63 g		
Randolph	2.87 ab		
Red Gold	2.73 b-g		
Renegade	2.85 a-d		
Robust	2.72 c-g		
Scarlett	2.76 a-g*		
Start	2.68 fg		
Wildcat	2.79 a-f		

* Means with the same letter not significantly different, P = .05.

† 1 = most to 9 = least resistance.

Summary

These data indicate that the new variety Freedom! has several attributes that make it especially useful for hay. It is less pubescent than Kenland and other varieties, which may permit faster drying, thus avoiding loss of quality due to rainfall. The reduced hairiness also improves air quality with possible benefits to humans and livestock. It is also equally well adapted for grazing and silage as it is very similar to Kenland in forage and seed yield, leafhopper resistance, and stem diameter. Consequently, Freedom! is suggested for use in the central clover belt, including Kentucky, as a replacement for Kenland.

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