

ALFALFA HAY FOR HORSES (AND HORSE OWNERS!)

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Alfalfa is one of the most common hays fed to horses in Kentucky. Other hays that are often used include timothy and orchardgrass. As a legume, alfalfa has many nutritional advantages over timothy or orchardgrass. Alfalfa hay contains more protein and calcium than grass hays and thus is an excellent source of these nutrients for broodmares and growing horses. Another legume that may be useful as a hay for horses is red clover. Nutritionally, red clover has many of the same advantages as alfalfa. However, red clover has some non-nutritional characteristics which have traditionally limited its popularity with horse owners. Red clover will occasionally cause horses to slobber excessively. "Clover slobbers" is not usually harmful to horses, but it is not a pleasing sight for horse owners. Even when red clover hay does not cause slobbering, some horse owners avoid it. Red clover hay may not have a nice green color preferred by horse owners, and it may also be somewhat dusty.

Recent research at the University of Kentucky has evaluated the preferences of horses for alfalfa and red clover hays. In addition, we have studied some of the sensory characteristics of hay (smell, texture, color). One of our questions was "Do any of criteria applied by humans to hay selection relate to whether a hay is preferred by horses?"

Two studies were conducted. In the first study, horses and humans evaluated two varieties of first cutting red clover and one variety of first cutting alfalfa. In the second study, a second cutting of each hay was compared. For both experiments, the red clover and alfalfa crops were raised at UK, so harvesting, baling and storage conditions were similar. The studies were conducted approximately 6-8 months after the hay had been baled. Each variety of hay was sampled for nutrient composition (Table 1).

	First Cutting			Second Cutting		
	RC1	RC2	Alf	RC1	RC2	Alf
Dry Matter (%)	91.3	91.5	92.1	92.1	91.5	92.9
Crude Protein (%)	15.5	14.5	18.1	17.3	17.5	17.6
ADF (%)	25.6	28.0	29.2	25.6	28.6	26.5
NDF(%)	35.4	38.5	38.7	39.2	40.3	37.0
NFC (%)	31.6	29.8	27.7	27.8	26.2	30.0
Ca (%)	1.9	1.16	1.39	1.54	1.55	1.22
P (%)	0.26	0.24	0.31	0.27	0.25	0.31

* Varieties were Kenland (RC1), Freedom (RC2) and Rushmore (Alfalfa)

SENSORY CHARACTERISTICS OF THE HAY

The sensory characteristics scored by humans included color, texture, dustiness, mold and smell. At least five people scored several bales of each hay. Each evaluator worked independently and scores were averaged after all evaluations were complete. Prior to scoring the test hays, evaluators practiced with the scoring system using approximately 20 hay samples. For each characteristic, a ten point scale was used where 1 was the best score and 10 was the worst score. A complete description of the scoring system is attached at the end of this paper, but briefly:

Dustiness:

- 1 = no dust
- 5= moderate dust in 30-60% of the bale
- 10= very heavy dust throughout the bale.

Mold:

- 1= no visible mold
- 5= visible mold on 50% of flakes
- 10= heavy mold throughout the bale

Color:

- 1=very bright green throughout bale
- 5= light brown with green mixed in
- 10= very dark brown to black

Smell:

- 1= freshly mown hay aroma, no other odors
- 5= a definite musty odor and may contain a slight putrefied or fermented odor
- 10=a strong fermented odor or a foreign odor from a contaminant

Texture:

- 1= very soft and leafy
- 5= medium texture with 40-60% stems or coarse material
- 10= very rough texture, high level of weeds and coarse material

The results of the sensory scoring are shown in Table 2. For the first cutting hays, the evaluators rated the red clover hays as having more mold and a less desirable odor than the alfalfa hay. In addition the first cutting clover hays were rated as having a mostly brown color, compared to the alfalfa which was rated as mostly green with some brown.

For the second cutting hays, differences between the alfalfa hay and the red clover hays were more obvious. The alfalfa hay had less mold and dust than the clover hay. In addition, the second cutting alfalfa hay had a greener color and better smell than the second cutting clover. However, the clover hays had a better texture score than the alfalfa. The second cutting clover hays were described as “medium texture with 40-60% stems”, whereas the alfalfa hay was described as “rough texture of mostly stems”.

Table 2. Sensory Ratings for the Red Clover and Alfalfa Hays.					
	Dust	Mold	Color	Smell	Texture
<u>First Cutting</u>					
Red Clover 1	3.4	3.1	5.9	4.5	6.6
Red Clover 2	3.6	4.0	6.7	5.3	6.5
Alfalfa	2.8	1.6*	4.4*	3.4*	4.8*
<u>Second Cutting</u>					
Red Clover 1	4.9	4.5	6.3	4.6	3.9
Red Clover 2	4.9	5.8	7.2	5.3	4.1
Alfalfa	1.6*	1.2*	4.4*	3.5*	5.9*
*The alfalfa score was significantly different ($P < 0.05$) from the red clover scores. Several bales of hay were scored for each variety by at least 5 evaluators. Each value in Table 2 represents at least 20 scores.					

HORSE PREFERENCES

After the hays were scored for sensory characteristics they were fed to six mature horses. First, the horses were adapted to a diet of timothy hay and a small amount of grain. Preference testing was conducted three mornings a week, before the horses received their normal morning feeding. Two-choice preference tests were used. Each horse was given 1 hour to select from two hay nets containing different hays. Hay nets were filled with 11 lb of the test hays and hung in the horses' stalls. The horses were given 1 hour to consume as much of each hay as they wanted. At the end of the hour, the hay nets were removed and the amount of hay remaining in each net was weighed. Each horse was test twice for each combination.

Preference was determined by comparing the amount of each hay consumed by each horse. The comparisons that were made were:

- First cutting alfalfa versus First cutting red clover 1
- First cutting alfalfa versus First cutting red clover 2

First cutting red clover 1 versus First cutting red clover 2
 Second cutting alfalfa versus second cutting red clover 1
 Second cutting alfalfa versus second cutting red clover 2
 Second cutting red clover 1 versus Second cutting red clover 2

Table 3. Amount of hay consumed when horses were given a choice between alfalfa and red clover hays for 1 hour.		
	First Cutting	Second Cutting
<i>Comparison: RC1 vs. Alf</i>		
RC1	2.2 +/- 2.2 lb	2.6 +/- 2.0 lb
Alf	2.6 +/- 1.3 lb	2.2 +/- 1.5 lb
<i>Comparison: RC2 vs Alf</i>		
RC2	2.2 +/- 1.3 lb	2.9 +/- 1.1 lb
Alf	2.6 +/- 1.0 lb	1.5 +/- 0.6 lb
<i>Comparison: RC1 vs RC2</i>		
RC1	1.8 +/- 1.1 lb	2.0 +/- 1.1 lb
RC2	2.9 +/- 1.3 lb	2.9 +/- 0.7 lb

Table 3 illustrates that horses did not exhibit a strong preference for any of the three hays. When they were offered a choice between red clover and alfalfa, they consumed similar amounts of each one. For the second cutting hays, the horses did not appear to show a preference when offered the RC1 and alfalfa, but there was a trend for horses to prefer the second cutting RC2 over the second cutting alfalfa. There was also a trend for horses to prefer the RC2 hay over the RC1, for both cuttings.

HORSES VERSUS HUMANS

One of our goals was to determine whether the sensory scores made by human evaluators would relate to choices made by the horse evaluators. The answer to this question appears to be “no”. In the first cutting hay, the sensory scores were consistently better for the alfalfa hay than for the red clover hay, except in the dust category, which were not different. When offered the first cutting hays, the horses did not exhibit a clear preference. For the second cutting hay, the sensory scores for dust, mold, smell and color were much better for the alfalfa than for the clover hays. However, horses clearly did not prefer the alfalfa. In fact, there was a trend for horses to prefer RC2 over the alfalfa hay! Although most of the sensory scores were in favor of the alfalfa hay for the second cutting, the texture score actually favored the red clover hay. Further research needs to be performed but it is possible that texture is a relatively important sensory characteristic for horses.

LEGUME OR GRASS HAYS

This study had two additional components. When it became clear that these horses did not prefer alfalfa to red clover hay, we conducted a preference test where horses could choose between the second cutting alfalfa hay and timothy hay. The study was conducted as above, where horses were given access to one hay net containing alfalfa and one hay net containing timothy and allowed 1 hour to consume the hays. The results are shown below (Table 4). It is clear that horses much preferred the alfalfa over the timothy. The result of the preference testing between timothy and alfalfa is consistent with many other studies that have shown that horses will consume alfalfa more readily than many grass hays.

Horse	Timothy (lb)	Alfalfa (lb)
D	1.0	3.7
Y	0.0	5.3
J	0.0	5.3
M	0.0	4.4
E	0.0	2.9
S	0.0	2.6
Mean	0.17 lb	4.0 lb (P<0.05)

Finally, we were interested in whether the legume hay consumed by the horses on test days would affect the amount of timothy they consumed on those days. As described above, the horses were used for preference tests three days a week. Preference tests were conducted before the horses were given their regular morning feed. For one week during the study, the amount of timothy consumed by the horses was measured on both preference testing days and non-test days. We hypothesized that on the days that the horses were given a preference test they would consume less timothy hay, because the legume they consumed in the preference test would replace an equal amount of timothy in their diet. We found that on the days that horses were not given a preference test, they consumed about 17 pounds of timothy hay. On the days that they were given a preference test, they consumed about 17 pounds of timothy and 5 pounds of the legume hays. Clearly, the access to the legume hays did not affect the amount of timothy the horses consumed, so there was no replacement effect. A replacement effect could occur if horses were given the opportunity to consume greater amounts of legume hay; however, additional research is needed to examine this possibility.

SUMMARY

The use of preference tests indicated that horses do not discriminate against red clover, in comparison to alfalfa, even though humans do. Sensory characteristics of the hay that were assessed by humans such as mold, dust, odor and color favored alfalfa hay over red clover hay. However, for the comparison of the second cutting red clover to the second cutting alfalfa, the red clover had a more desirable texture score. Even though horses did not appear to have a preference for alfalfa over red clover, they showed a clear preference for alfalfa over timothy hay.

Appendix 1: Visual Hay Evaluation System

In this system, the dust score is distinguished from the mold score by color. If a whitish color is seen on the cut edge of the bale then a mold score will be obtained.

Dust Score

- 1 No dust
- 2 Very slight dust in 10 to 20% of the bale- cut side only
- 3 Slight dust in 20 to 50% of the bale
- 4 Moderate dust in 10 to 30% of bale
- 5 Moderate dust in 30 to 60% of the bale
- 6 Moderate dust in greater than 50% of the bale or heavy dust in 10%
- 7 Heavy dust in 10 to 40% of the bale
- 8 Heavy dust in 40 to 60% of the bale
- 9 Heavy dust throughout the bale
- 10 Very heavy dust throughout the bale

Mold Score

- 1 No visible mold
- 2 Visible mold in only one location in the entire bale
- 3 Visible mold at low level in 2 to 3 locations
- 4 Some visible mold in 25% of the flakes
- 5 Visible mold on the outside of half of the flakes
- 6 Visible mold inside 10 to 20% of the flakes
- 7 Visible mold in 20 to 40% of the bale
- 8 Visible mold in 40 to 60 % of the bale
- 9 Visible mold in greater than 80% of the bale
- 10 Heavy mold throughout the bale

Color Score

- 1 Very bright green- excellent color throughout the bale
- 2 Very good color with some slight bleaching
- 3 Green color with some slight brown spots
- 4 Olive green to brown mixed with green
- 5 Light brown with green mixed
- 6 Mostly light brown
- 7 Medium brown color in most flakes
- 8 Dark brown in some locations or flakes
- 9 Dark brown in 50% of the bale
- 10 Very dark brown to black

Texture Score

- 1 Very soft- mostly leafy material throughout the bale
- 2 Soft- with very few stems and weeds
- 3 Still soft but with 30 to 40% stems or coarse material (including weeds)
- 4 Medium texture with 40 to 60% stems or coarse material (including weeds)
- 5 Medium texture with 60 to 80% stems and coarse material (including weeds)
- 6 Rough texture of mostly stems.
- 7 Rough texture with very little leaf content and the bale is made up of mostly stems and weeds
- 8 Rough texture with no leaf content and 50 to 60% weeds and small stems
- 9 Rough texture with no leaf content and 60 to 80% weeds and small stems
- 10 Very rough texture with 80 to 100% weed content and lacks the evidence to distinguish what the type of hay is within the bale

Odor Score

- 1 Freshly mown hay aroma, no other odor can be detected
- 2 Freshly mown hay aroma, but a slight mustiness can be detected
- 3 Greater degree of mustiness, freshly mown hay aroma is difficult to detect
- 4 Hay has only a musty odor, completely lacking any sense of being freshly mown, may also be combined with a foreign odor such as animal urine or other non-toxic substances
- 5 The hay contains a musty odor and has slight putrefied/ fermented odor
- 6 The hay is becoming more putrefied/fermented, with a slight hint of mustiness
- 7 Only a fermented/putrefied odor remains
- 8 Strong odor that is becoming more apparent than the putrefied odor
- 9 Very strong fermented odor with no other odors detectable
- 10 The hay smells "hot" and has a repulsive degree of a sour and fermented odor, may also be combined with a foreign substance such as gasoline, oil, pesticide, etc.