



ALFALFA

The High Quality Hay for Horses

Dr. Dwayne A. Rohweder, Professor of
Agronomy — Extension, University of
Wisconsin, Madison

Raymond Antoniewicz, Assistant Professor of
Meat and Animal Science (Equine) —
Extension, University of Wisconsin, Madison



Photo: Mischka Farms

Left Photo: Kentucky Horse Park



Photo: Quarter Horse News

HORSES ARE MORE POPULAR than ever, and their numbers are increasing dramatically throughout the United States.

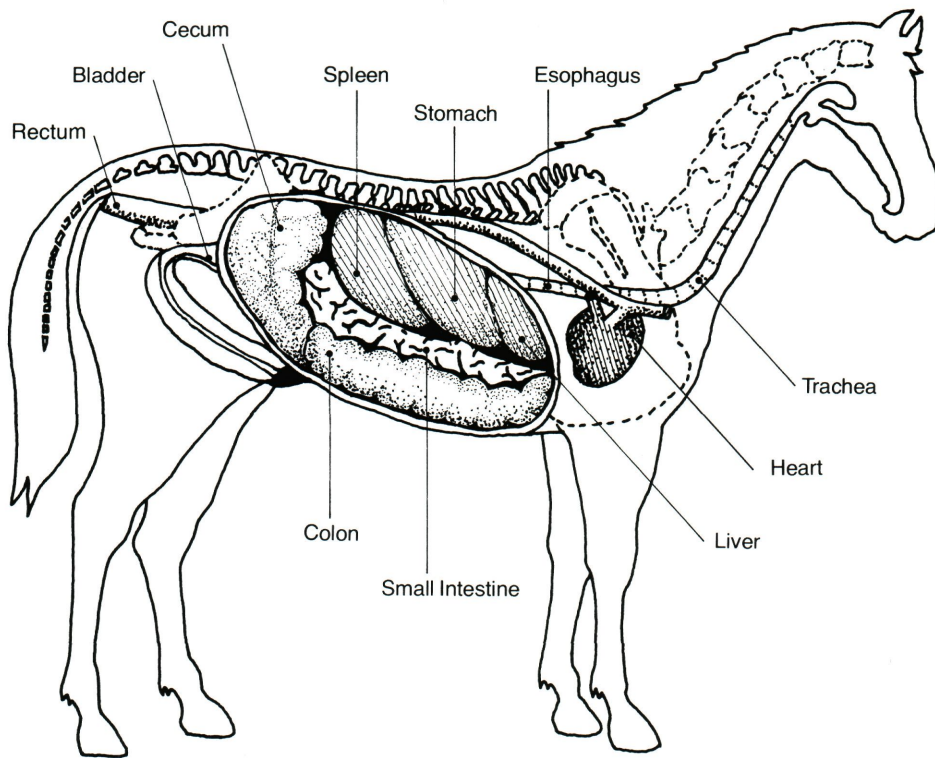
The majority of horses are owned and managed for recreation and not for profit, by owners who are concerned for the welfare, health and contentment of their horses. Many horses are located in or near urban areas where grazing and feed supplies are limited. Thus, considerable feed and forage (roughage) must be purchased. Horse owners should realize that high quality forage supplies most of the horse's needed nutrients and, compared to purchasing lower quality forage, saves money in the long run.

The Challenge

More myths are associated with feeding horses than with feeding most other animals. In part, this may be due to a lack of current research information on their feeding and nutrition. In addition, many horse owners may have little agricultural experience and may be owning a large animal for the first time. And, it may be that both an art and a science are involved in properly feeding a quality race, draft, performance or pleasure horse.

Less than two decades ago, "horse hay" meant dry, dust-free, sweet-smelling, mature grass hay — often timothy. Horses fed high quality alfalfa hay were thought to slobber, develop damaged kidneys, have increased urine output and generally not thrive. However, horse owners now realize that alfalfa is not the problem and that past feeding practices are not always acceptable under today's economics.

Horses differ, and what is good for the idle, mature horse, for example, may not be best for a race or show horse. There are no magic potions, high performance feed "secrets", or short cuts that will transform a common horse into a champion. Good horse health and stamina result from practicing a reliable management program which includes feeding a ration balanced to meet the individual horse's needs.



The Horse's Digestive System

The horse is a difficult animal to feed properly because of how its stomach is constructed and used. Horses are natural grass eaters, but, in contrast to ruminant animals, horses have a single, comparatively small stomach with a relatively limited capacity, and a rapid passage rate for feed. The horse's simple stomach is incapable of tolerating mold or dust without possible digestive disturbances, and cannot effectively use low-quality hays that are high in fiber because they stay in the digestive tract too long. Thus, a premium is placed on using high quality feeds. Horses also should be fed frequently rather than given large amounts in a single feeding.

Digestion of soluble carbohydrates, fats and proteins takes place in the small intestine. The horse has a cecum located between the small and the large intestine (colon), which functions like a fermentation vat in which microorganisms (bacteria and protozoa) act on the fiber of feeds. These microbes enhance the digestion of cellulose and hemicellulose (fibrous components which are only partially digestible) using dietary protein and nonprotein nitrogen while synthesizing intestinal protein, B-complex vitamins and vitamin K.

Ruminants, such as cattle and sheep, however, have a rumen which also is similar to a fermentation vat but is located in the forepart of the digestive tract. Forages are swallowed unchewed, regurgitated and mixed with saliva during chewing. Through this process ruminants more effectively use large amounts of lower quality forage than non-ruminants. However, the species of bacteria and protozoa present in a horse's cecum are the same as those in a cow's rumen.



Photo: American Quarter Horse Association

“Knowing how to feed horses and properly meet their needs is an art.”

The Art and Science

Knowing how to feed horses and properly meet their needs is an art. Each horse has specific nutritional needs based on its performance and feed preferences, and close observation is needed to determine those individual variables.

The science of feeding horses requires an understanding of the horse's digestive system, as well as a knowledge of feeds, including their analyses and limitations, and how to combine those feeds into a balanced ration.

An efficient job of feeding horses depends on the judgement of the feeder, his/her attention to details and commitment to continually do a good job.

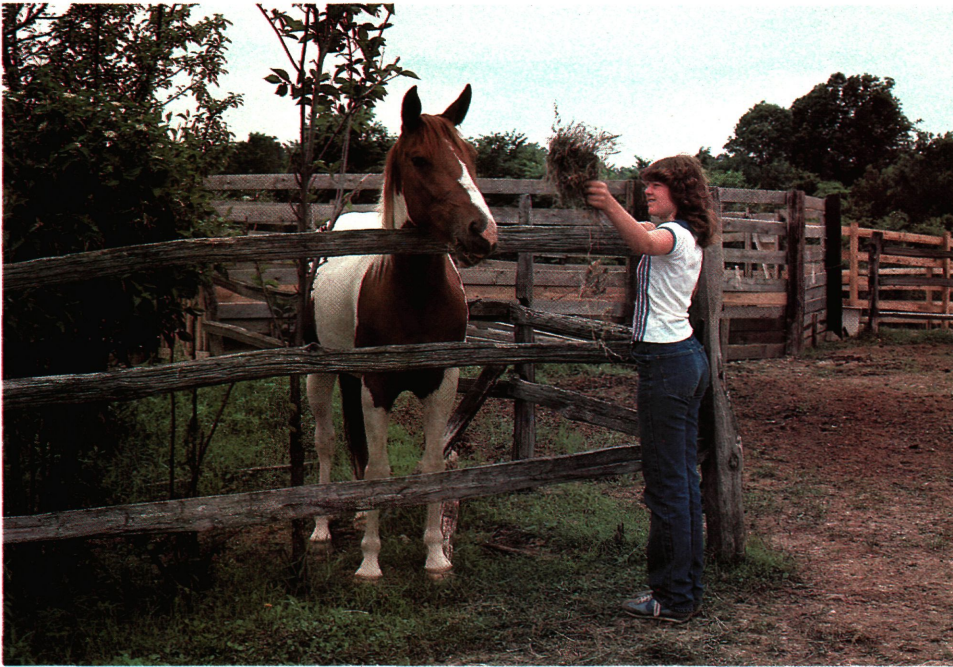


Photo: Sandra J. Phillips

Alfalfa: An Ideal Legume Hay



Photo: Jim & Anne Mischel for The Appaloosa Horse Club, Inc.



Photo: American Morgan Horse Association by Suzy Lucine

ALFAFSA IS BEING USED increasingly in well balanced horse rations. For many years dairymen have sought the highest quality alfalfa hay; yet, horsemen who are dealing with animals not as well suited to lower quality forages have traditionally fed low quality grass hay. The concern with “hay belly” in horses attests to this. Hay belly — a distended abdomen — results when horses consume large quantities of less digestible hays such as grass hays. High quality alfalfa does not produce hay belly because it is low in fiber content and high in digestibility.

Unjustified prejudice against alfalfa is disappearing as research and experience with alfalfa indicate that it is an excellent feed for horses. High quality alfalfa is becoming the preferred hay at many race tracks and show barns, and many horse owners now use alfalfa exclusively with excellent results.

As John Williams, Manager of Spendthrift Farm near Lexington, Kentucky, has stated, “The very best hay you can feed a horse is alfalfa hay.” And Spendthrift feeds alfalfa to some very famous and expensive stallions, like Seattle Slew and Triple Crown Winner Affirmed.

Research in Texas, Washington, Delaware, Kentucky and other states has shown that (1) horses prefer legume hay to grass hays, with alfalfa a top choice; (2) high quality is preferred to lower quality; (3) alfalfa should be the only forage fed to foals, lactating mares, pleasure horses and stallions not on pasture; (4) adult horses on poor pasture do well with alfalfa supplementation; (5) lightly exercised adult horses relish alfalfa hay to the extent that they will become obese if overfed; (6) alfalfa can be fed effectively as dry hay, cubes, pellets or de-hy. (feed some long hay or pasture along with pellets to discourage “wood chewing”) and (7) alfalfa is an excellent source of protein, digestible energy, minerals, vitamins and other nutrients that are highly beneficial to horses. **Ten pounds of early cut alfalfa hay will probably out-yield most horse “conditioners” on every labelled ingredient except vitamin B-12, and will supply most of the horse’s energy and protein needs.**

There is considerable variation in the “best” amount of forage to feed horses. Most idle or lightly exercised, mature horses can be kept in good condition on alfalfa hay. Many horse owners prefer to feed at least one pound of high quality forage for each 100 pounds of body weight to prevent digestive disorders and colic. Other owners restrict hay for racing horses to about ½ pound for each 100 pounds of body weight.

All horses require a ration containing ample crude protein. Protein and calcium/phosphorus requirements for different classes of horses are shown in Figure 1.

“The very best hay you can feed a horse is alfalfa hay.”



Figure 1

Class of Horse	Crude Protein %	Calcium and Phosphorus Ratio		
		Minimum	Maximum	Optimum
Weanlings	16 to 18	1:1	3:1	2:1
Yearlings	13 to 15	1:1	4:1	2:1
Two year olds, lactating mares	12 to 14	1:1	5:1	2:1
Mature, maintenance	10 to 13	1:1	5:1	2:1



Photo: Seattle Slew by University of Kentucky Cooperative Extension

The Science of Feeding

Forages can and should provide the major portion of a horse's ration. Because pastures are often low in quality or unavailable, selecting high quality hay is most important for providing an efficient and economical ration. The higher the quality of hay, the lower the amount of concentrates needed to balance a ration and the greater the number of options available for feeding your horse.

High quality hay has a high nutrient composition, including crude protein and digestible energy and a high intake and acceptability. It is low in cell walls or fiber.

Hay for horses should be (1) at an early or immature stage or growth when harvested, (2) relatively fine stemmed and leafy, (3) free from grass and weeds, toxic substances and excessive foreign material, (4) bright green in color, (5) free from rain damage, dust, mold and spoilage, (6) high in legume content to provide a higher intake, and (7) a quality forage at least cost. **Early cut alfalfa hay meets these criteria.**

Table 1. Composition of several forage crops used in horse diets - percent dry matter.

Forage Crop	Stage of Maturity	DE ^a Mcal/kg	TDN ^b %	CP ^c %	Lysine %	Ca %	P %
Alfalfa	Pre-bloom	2.78	63	19.4	1.10	2.10	0.34
	First flower ^d	2.42	56	17.9	0.94	1.75	0.28
	Mid-bloom	2.29	52	16.0	0.90	1.50	0.25
	Full bloom	2.16	49	15.0	0.64	1.29	0.25
Bromegrass	Late bloom	2.38	54	7.4	—	0.32	0.22
Timothy	Pre-head	2.20	50	11.5	—	0.50	0.25
	Head	1.98	45	9.0	—	0.41	0.19

Adapted: NRC, No. 6, 4th Rev. Ed., 1978

^aTotal Digestible Energy, divide by 2.2 to obtain (Mcal/lb).

^bTotal Digestible Nutrients; improved harvest techniques can increase values 10 percent.

^cCrude Protein

^dApproximates first flower to 1/10 bloom

Note: Acid detergent fiber (ADF) values will range from 31, 31-35, 36-41, to 41 percent for alfalfa pre-bloom, early bloom, mid-bloom and full bloom alfalfa or mature grass, respectively. Digestibility declines with increasing ADF. Neutral-detergent fiber (NDF) which predicts intake will range from 40, 40-46, 47-51, 51, 55, to 55-60 percent for alfalfa pre-bloom, early bloom, mid-bloom, alfalfa full bloom, pre-head grass, and mature grass, respectively. Intake decreases as NDF increases.

Table 2. Suggested daily nutrient requirement needed by horses in several stages of growth and activities.

Stages/Activity	Daily Feed-lb.	DE ^a Mcal	TDN ^b lb.	CP ^c		Ca		P	
				%	lb.	%	g	%	g
Weanling	11	15.6	7.8	16	1.74	0.70	34	0.50	25
Yearling	14	16.8	8.4	14	1.67	0.55	31	0.40	22
Two year old	15	16.5	8.2	13	1.39	0.50	25	0.35	17
Mature Horse-1000 lbs									
Maintenance ^d	16	16.4	8.2	10	1.39	0.35	23	0.30	14
Pregnancy-last 90 days	20	18.4	9.2	11	1.65	0.50	34	0.35	23
Lactation-30 lbs milk	25	28.3	14.1	13	2.99	0.50	50	0.35	34
Light work ^e	20	18.4	9.2	10	1.65	0.35	34	0.30	23
Heavy work ^f	25	28.3	14.1	11	2.99	0.35	50	0.30	34

Adapted: NRC, No. 6, 4th Rev. Ed., 1978

^aDigestible Energy

^dIdle adult horse

^bTotal Digestible Nutrients

^eHorses for pleasure, riding, etc.

^cCrude Protein

^fHorse in race training, polo, etc.

Table 3. Typical rations of hay and grain for horses in several stages of growth and activities using hays of varying quality — pounds per day^a.

Stages/Activity	Daily Feed-lb.	Alfalfa first bloom ^b		Alfalfa full bloom ^c		Timothy head ^d	
		Hay	Grain	Hay	Grain	Hay	Grain
Weanling	11	6	5	—	—	—	—
Yearling	14	8	6	8	6	8	6
Two year old	15	10*	4	10*	5	10	5
Mature horse-1000 lbs							
Maintenance	16	10	4	10	5	11	5
Pregnancy-last 90 days	20	10**	5	12**	5	20	5
Lactation-30 lbs milk	25	20	4	18**	7	18	7
Light work	20	10**	5	12**	5	12	8
Heavy work	25	20	4	18**	7	18	7

^aGrain mix of oats/corn (50/50) = DE-3.6 Mcal, TDN-80%, CP-11%, Ca-0.06%, P-0.5%

^bCP high with all except foals; monosodium phosphate fed free-choice.

^cWill not meet needs of foals; CP high for all classes; monosodium phosphate fed free-choice.

^dWill not meet needs of foals; CP supplement needed for all classes; calcium supplement fed free-choice.

*See statement (pp. 6) on mixing alfalfa and grass hays.

**Added early cut grass hay may be fed.

ALFALFA HARVESTED AT the bud to early flower stage of maturity will provide most of a horse's needs, as shown in Table 1.

High quality, early cut alfalfa hay provides the protein needs of weanling foals, while full bloom alfalfa hay provides more than the needed crude protein for all types of horses. By purchasing pure, early cut alfalfa hay, horse owners can mix alfalfa with high quality grass hay to regulate protein levels for the various types of animals, without changing their grain mixture. Protein levels can be decreased for idle horses by increasing grass hay fed, while protein levels can be increased for pregnant mares or working horses by increasing the alfalfa fed. Feeding legume hay/grain rations to horses exercised vigorously does not increase their sweating, respiration or pulse rate.

It is difficult to develop satisfactory rations for weanling foals using mature alfalfa and grass hays. Feeding inadequate protein such as in low quality grass hay diets significantly retards growth.

Timothy or grass hay does not supply the protein and calcium requirements for all types of animals, as shown in Tables 2 and 3, and does not provide the energy needs for lactating mares and working horses. Thus, additional energy supplementation is needed — over and above the amounts consumable by these horses — or alfalfa hay must be substituted. Purchased crude protein and calcium supplements also are needed with grass hays, but the required amounts decrease when grasses are fertilized and harvested at an immature stage.

Feeding high quality alfalfa hay free-choice reduces purchased feed costs for all types of horses. Purchased grain supplements may make up only about 25 percent of the ration when early cut alfalfa is fed, but will approach 50 percent with mature alfalfa and grass hays.

The calcium and phosphorus ratio in feedstuffs also is a concern in feeding horses. The concentrations of calcium and phosphorus in alfalfa hays are generally satisfactory and not a great problem because many horse managers feed grain which is high in phosphorus. A phosphorus supplement fed free-choice may be needed when feeding early cut alfalfa.

Some managers are concerned about the effect of excess protein in the diet when feeding alfalfa hay. Don't abruptly shift from a low quality feed to high quality alfalfa. Start gradually with a mixture to condition the horse. There may be some increased urine production, but it is a very slight problem or no problem at all when fed properly.

Selecting Quality Hay

Selecting high quality hay is the most important factor in providing effective rations for horses. Consider the following criteria when growing or purchasing hay for your horse:

- **Select legumes or legume-grass mixtures.** Alfalfa and alfalfa-grass mixtures with less than 20 percent grass provide high yields of quality forage that are free from molds, dust and toxic substances. Pure alfalfa is preferred to provide protein needs and permit flexibility in ration formulation. If a mixture is purchased, select a late maturing grass such as timothy.

- **The stage of maturity at harvest determines the quality.** Alfalfa should be cut by first flower (appearance of the first flower in the field). Cut grasses by the boot stage (no heads showing). Young, immature plants are highest in energy and protein and lowest in fiber. Concentrations of all the important feed constituents of alfalfa and other forages decline with maturity. And, in legumes the digestibility of crude protein increases as the percentage or concentration of crude protein increases. Thus, early cut alfalfa hay not only has a high quantity of protein but also has high digestibility.

- **Leafiness is an indicator of quality.** A high proportion of leaves is desired because leaves contain more nutrients than stems. Immature, fine textured alfalfa hays usually have a high percentage of leaves to stems. Alfalfa leaves contain four times the crude protein and seven times the carotene as stems.

- **Texture pertains to stem size and palatability.** Fine-stemmed hay that is "soft" to the touch indicates to some extent palatability or acceptance by animals. Small pliable stems are desired.

- **Color is often deceiving and overrated.** A bright green color often indicates the absence of weathering, molds and heat damage. However, color

in legumes and grasses can be influenced by fertilization and curing. In general, color is for the benefit of man, as the horse is color blind and cannot distinguish green from brown.

- **Smell is useful in evaluating hays.** Hay having a musty or moldy odor is not acceptable to horses because they are susceptible to mold toxicity or colic. Hay that is brown and has a caramel odor indicates that heating has taken place and that crude protein digestibility has decreased.

- **Weeds reduce yield, quality and may be toxic.** Weeds compete with forage plants for moisture, plant nutrients, light, air and space. Weeds usually lower hay quality because they are generally low quality plants and many are objectionable to livestock. Certain weeds such as nightshade, etc. are poisonous to horses. Also, many weeds do not cure as quickly as forage plants, and, therefore, may cause mold in cured hay.

"...early cut alfalfa hay is unquestionably the best forage (roughage) the horseman can choose."

- **Chemical analyses are a valuable guide.** Chemical analyses can determine the nutritive value of hay. The most common chemical analyses used to evaluate hay are for dry matter and crude protein percentage. However, newer fiber analyses for acid detergent fiber and neutral-detergent fiber are useful in predicting digestibility and intake, respectively.

- **Test your forage.** Test for crude protein, acid-detergent fiber and neutral detergent fiber to determine feed value or quality. Purchase forage based on quality.

- **Purchase hay by the ton, not by the bale.** When buying by the ton, you need not be concerned about individual bale weight and size. But, if you buy hay by the bale, take along a scale to determine weight, size and value of the hay by the ton.



- **Purchase hay baled in an attractive package (uniform bale size and shape) to obtain top value.** High quality hay is early cut, green, leafy and free of rain and insect damage, weeds, excessive grass, dirt, mold, spoilage and dust. Hay should have not more than 20 percent moisture at harvest — 12 percent out of storage — in uniform bales that measure 14 x 18 x 38 inches and weigh 50 pounds after curing. (Bales are larger in California and some other western states and baling should not be done at more than 17% moisture in this area of the country.) Increased moisture content at baling and bale density usually increase spoilage and reduce hay value. Mow drying or drying by solar energy will generally improve quality in hay.
- **Store bales stacked on the cut edge for the best drying and reduced spoilage.**
- **Horses do not relish hay treated with propionic acid.** However, a number of other chemicals are being studied for application before baling. These will make it possible to bale and store hays safely with shorter field drying times. Evidence to date indicates that these treated hays are safe to feed to horses, providing no dust or mold is present.

Summary

When free of mold and dust, early cut alfalfa hay is unquestionably the best forage (roughage) the horseman can choose. Alfalfa can safely make up the entire roughage ration. In addition to supplying energy, alfalfa will meet all or nearly all of a horse's protein needs.



Photo: Kentucky Department of Tourism

*Cover Photo: University of Missouri
Cooperative Extension by Duane Dailey*



Produced by:
Certified Alfalfa Seed Council, Inc.
P.O. Box 2023, Woodland, CA 95695

The authors thank the following:

Dr. Vern Marble, University of California, Davis;
Dr. Duane Miksch and Dr. Garry Lacefield,
University of Kentucky; Dr. Neal Martin,
University of Minnesota; Prof. James Ross, Dr.
Melvin Bradley and Dr. Wayne Loch, University
of Missouri; and Ms. Cris Merck, University of
Wisconsin, Madison, for their thoughtful review
and editing of this publication.