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Hemp Seeds Rival Soybeans in Protein Quality

Soybean meal is the most commonly added protein source in horse feeds. However, increasing numbers of horse owners are shying away from feeding it, most commonly because of allergic reactions. Most soybeans grown in the U.S. have been genetically modified, which is a concern for many. Furthermore, it is difficult to ascertain from a feed label if the soy product has been heat-treated (necessary for inactivating trypsin inhibitor found in raw soybeans). Finally, soy contains significant levels of phytoestrogens, which may influence behavior, affect breeding, or interact with other hormones.

The good news about soybeans is their protein quality -- it compares favorably to protein found in animal sources. But there are other choices, the most promising of which is hemp seed.

Understanding protein quality

Proteins are long, complex chains of amino acids. Once protein is digestion, the amino acids travel to tissues, where they are "reassembled" into specific proteins for that particular part of the body, assuming all of the building blocks (amino acids) are available. Your horse can synthesize some amino acids, but there are 10 that your horse cannot produce, or cannot produce in adequate quantity, and therefore, they must be in his diet (listed in Table 1). These are referred to as *essential amino acids* (EAAs).

Most feeds contain some protein, and therefore, some EAAs, but if any EAAs are present in low amounts, they limit the extent to which the others can be utilized, resulting in leftover amino acids. And, unfortunately, amino acids cannot be stored to be used later. Instead, they are dismantled by the liver, putting strain on the kidneys to remove urea, and contribute to excess calories and even glucose production.

Hemp seeds

A relatively new food to western cultures, hemp seeds have exceptional protein quality. Their two main proteins are albumin and edestin, both of which have significant amounts of all EAAs. They are comparable to soybeans' protein content and in many cases, exceed the EAA content of the animal protein, whey (found in milk), as shown in Table 1.

Table 1: Essential Amino Acid (EAA) Comparison between Hemp seeds, Soybeans, and Whey (grams per 100g)[1]

EAA	Hemp seeds	Soybeans	Whey
Methionine	0.58	0.53	0.23
Arginine	3.10	2.14	0.39
Threonine	0.88	1.35	1.02
Tryptophan	0.20	0.41	0.25
Histidine	0.71	0.76	0.29
Isoleucine	0.98	1.62	0.85
Leucine	1.72	2.58	1.40
Lysine	1.03	1.73	1.15
Valine	1.28	1.60	0.91
Phenylalanine	1.17	1.78	0.49

Hemp seeds rival soybeans as an ideal protein

What's even more impressive, however, is the ratio of each EAA to the lysine level – a true measure of protein quality. With horses, quality is determined by comparing each EAA to lysine as it would exist in muscle[2]. Lysine is assigned a value of 100. The ideal values are shown in Table 2, which reveals how every EAA found in hemp seeds surpasses the ideal ratio beyond soybean's ability.

Table 2: Ratios of EAAs to Lysine, Compared to Ideals[3]

EAA	Hemp seeds	Soybeans	**Ideal**
Methionine	56	31	**27**
Arginine	301	124	**76**
Threonine	85	78	**61**
Tryptophan	n/a	n/a	n/a
Histidine	69	44	**58**
Isoleucine	95	94	**55**

Leucine	167	149	**107**
Lysine	100	100	**100**
Valine	124	92	**62**
Phenylalanine	114	103	**60**

Hemp seeds are easy to find in stores that sell whole foods. Horses enjoy their palatable, nutty flavor. Adding ½ cup (providing 25 grams of protein) to your horse's daily ration will boost the overall protein quality of his diet.

Bottom line

Domesticated horses cannot easily enjoy the variety of feedstuffs a natural setting provides. Even the healthiest grass pasture may not meet every nutrient requirement. Offering whole foods on a regular basis, such as hemp seeds, gives you another tool in meeting your horse's protein needs.

[1]Callaway, J.C. 2004. Hempseed as a nutritional resource: An overview. *Euphytica*, 140. Pages 65-72. Printed in the Netherlands.
[2]National Research Council. 2007. Proteins and amino acids. *Nutrient Requirements of Horses, Sixth Revised Edition*. Washington, D.C.: The National Academies Press. Pages 64-65.
[3]Hemp seed and soybean values were calculated by dividing each EAA level by its lysine level (1.03 for Hemp seeds; 1.73 for Soybeans; shown in Table 1)

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