GRAIN PROCESSING FOR HORSES: DOES IT PAY?

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The question of whether grain for horses should be fed whole or rolled has been an issue for horse owners for at least 100 years. Horse owners believe that horses digest processed grain better than whole grain because they readily observe hulls in the manure of horses fed whole grain. However, this observation is not a good indication of grain digestibility. When the grain is processed, there is still undigested material in the manure but it is just not as easy to identify.

Processed grain, for most horsemen, means grain that has been dry rolled, crimped, steam rolled or steam flaked. For the purpose of this discussion, the focus will be on these processes and how they affect the horse's ability to extract nutrients from the grain.

The reason grain is processed is to alter the physical form of the grain to improve the availability of nutrients. With processes such as rolling or crimping, the particle size is changed, thereby increasing the surface area to allow for greater exposure of the feedstuff to digestive enzymes. When the process includes heat, the starch in the grain is gelatinized and this may increase starch digestion.

Researchers in the early 1900s, evaluating rolled grain versus whole grain, reported improvements in growth performance of horses fed rolled grain. Morrison et al. (1919) suggested a 5-6% improvement with working horses fed crushed oats. The horses on crushed oat diets were fed at 95% of the grain intake of the whole grain fed horses yet still had better weight gains, and were observed to be in better condition. Caine (1931) reported 24% faster gains on 21% less feed with horses fed crushed versus whole grain. The result of this research has been the foundation of the recommendation that rolling or crushing oats will result in a 5-7% improvement while processing hard grains such as barley and wheat will result in even greater improvement. These early reports suggest that processing grain will result in faster growth and better utilization of the processed grain. However, more recent research that has looked at either growth performance or nutrient digestibility suggests that processing of grains fed to horses does not result in improvements in performance or nutrient digestion that justify the cost of processing.

Hintz et al. (1972) reported the effects on digestion of crimped oats versus whole oats. The results (Table 1) indicate that there is no improvement in digestibility of dry matter, crude protein, or neutral detergent fiber. French researchers comparing oats, corn or wheat fed either whole or crushed indicated no differences due to processing in the parameters measured (Table 2) (Wolter et al., 1982). Meyer et al. (1993) compared processing methods and their effects on prececal starch digestibility of oats and corn. This research indicated that in order to increase starch digestibility in the small intestine, a significant increase in

surface area or greater disruption of the starch granules by heat is required, when feeding corn. Dr. Meyer's work shows that the processing of oats by rolling does not improve prececal starch digestion.

Table 1. Comparison of digestibility of whole and crimped oats.

	Digestibility		
	Dry Matter	Crude Protein	Neutral Detergent Fiber
Oats			
Whole	73.2 ± 4.	85.6 ± 2.7	36.4 ± 4.0
Crimped	75.8 ± 2.2	84.7 ± 3.0	39.2 ± 4.5

Hintz et al. (1972)

Table 2. Apparent digestibility of diets containing oats, corn, wheat*.

	Oats		Corn		Wheat	
	Whole	Rolled	Whole	Crushed	Whole	Rolled
Dry Matter, %	72.7 ± 3.0	74.0 ± 1.8	76.9 ± 1.8	76.6 ± 2.6	75.4 ± 5.2	74.4 ± 7.1
Crude Protein, %	75.0 ± 4.1	77.8 ± 3.2	59.8 ± 10	58.3 ± 10.6	60.0 ± 2.4	58.0 ± 2.35
Organic Matter, %	74.0 ± 3.4	75.4 ± 1.9	78.8 ± 1.8	80.0 ± 3.4	77.0 ± 5.1	77.0 ± 6.4
Starch, %	99.3	99.3	99.6	99.7	99.7	99.0

*Values are means ± standard deviations. Wolter et al. (1982)

Research in Alberta compared whole oats to dry rolled oats, and whole barley to dry rolled barley fed to mature horses at maintenance (Coleman et al., 1985). In addition to processing, the oat diets were fed at two different levels of intake. The processing of the oats did not improve dry matter or energy digestibilities (Table 3). As well, dry rolled barley had similar digestibilities for dry matter and energy as whole barley (Table 3).

Table 3. Dry matter and energy digestibilities for whole oats, rolled oats, whole barley or rolled barley.

Grain	Daily Grain Intake	DM Digestibility %	Energy Digestion %
Whole Oats	2.25	55.4[a]	57.5[a]
Rolled Oats	2.25	53.9[a]	57.9[a]
Whole Oats	4.5	63.5[a]	63.0[a]
Rolled Oats	4.5	62.9[a]	62.1[a]
Whole Barley	4.5	69.3[b]	67.3[b]
Rolled Barley	4.5	70.5[b]	69.8[b]

All diets included alfalfa cubes as forage component. Coleman et al. (1985)
[ab]Values in each column with different superscripts are significantly different (P>0.05)

Processing grain for young growing horses has been reported to improve gains and feed utilization. In a growth trial, 60 yearling colts of mixed genetic background were fed diets based on oats (whole or rolled) or barley (whole or rolled). Grain was processed by dry rolling for both grain treatments. The diets were 80% concentrate, 20% forage and the horses were fed to appetite. The horses on the oat-based diets gained 0.93 and 0.92 kg/day for the whole and rolled groups respectively (Table 4). These differences were not significant. The horses fed the barley diets had gains of 0.70 kg/day for the whole barley and 0.86 kg/day for the rolled barley. The difference in gain due to processing of the barley diets was significant (P<0.05) (Coleman, unpublished data). Feed:gain ratios for the treatments in this trial were not significantly different (Table 4).

Information on the effects of processing cereal grains for horses is limited. For oats, it appears that processing does not improve growth performance or improve nutrient availability. Frape (1986) suggested that if processing increased the cost of the oat grain by more than 10%, it could not be justified. The research available would support this and the information presented here supports that processing oats for the reasons of improving nutrient utilization is not justified.

Table 4. The effect of rolling oats or barley on the daily gains and feed: gain ratio of yearling horses[1].

	Oats		Barley		SEM[2]	Probability
	Whole	Rolled	Whole	Rolled		
Daily Gain	0.92[a]	0.93[a]	0.70[b]	0.86[a]	0.05	0.04
Feed:Gain Ratio	10.0	9.5	11.90	10.5	0.62	0.11

[1]Values are least square means.
[2]Pooled standard error of the mean.
[ab]Values within a row with unlike superscripts are significantly different.

With other grains such as barley, corn, and wheat, the use of a processing method such as dry rolling or crimping does not result in significant improvements in nutrient utilization. In order to improve starch availability in corn, Meyer et al. (1993) suggests that grinding or the addition of heat are effective in increasing starch digestion prececally while only cracking the grain does not. This may also be true for barley in that a greater disruption of the starch by using a heat processing method may be required for improved digestion.

Conclusions

The reason for processing cereal grains for horses is to improve nutrient availability. Of particular importance is the availability of energy because grain is fed primarily to supply energy.

Therefore, should you process grain for horses?

1) The processing of oats has little effect on nutrient availability and is not recommended from a nutritional point of view.
2) Dry rolling barley did not improve energy or dry matter digestibility in mature horses but did improve daily gain in yearlings. Use of a heat process such as steam flaking may improve barley even further and would be justified, particularly if the feed is used for young horses.
3) Grinding or heat processing of corn significantly increases the availability of the starch fraction and should be considered. Processing corn by just cracking it does not improve nutrient availability enough to justify the additional cost.
4) Feeds for young horses under 1 year of age should include processed grain. (If the feed is a creep feed, a pelleted product would be the best). Processing of grain for older horses with teeth problems is recommended.

The use of rolled, crimped or steam flaked grain will continue in feeding horses. The reasons for its use will not reflect advantages in nutrient availability but will be due to marketing and production of commercial feeds. There will be the continued concern by horse owners when whole grains, particularly oats, are included in the concentrate mixture, because hulls will be visible in the manure. It is important to remember that most of these visible hulls are just that, only hulls which are poorly digested. Even with rolled or crimped oats, hulls are in the manure; however, they are not easily distinguished from the rest of the manure. The process selected and the cost of processing grain must be evaluated in relation to improvements in performance. For most feeding situations, these additional costs are not justified. Therefore, the challenge when supplying horse feeds is to provide sound, nutritionally correct feeds in a form the consumer wants to buy.

References

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