

Effect of Feeding DDGS to Companion Animals

A Literature Review

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Horses

Very little research has been conducted related to feeding diets containing DDGS to horses and other companion animals. Estimations of digestible energy of distillery by-products range from 11.5 to 14.2 MJ/kg of dry matter (DLG, 1995) and the relatively high concentration of crude protein in DDGS may it to partially replace soybean meal or dried skimmed milk powder in horse feeds (Frape, 1998). Furthermore, the relatively high oil content in DDGS may be an important energy source for performance horses (DLG, 1995; Orme et al., 1997). Leonard et al. (1975) evaluated *in vitro* cellulose digestibility of dried distillers solubles (DDS) and DDGS and showed that both ingredients stimulated cellulose digestion. They also evaluated the effect of adding DDGS to the diet at levels of 0%, 5%, and 10%, or administering half of the DDGS (10% of total diet) directly into the cecum via a fistula 4 hours after each feeding. The cecally-administered DDGS resulted in significantly higher cellulose digestibility (32.4%) compared to feeding an equivalent amount of DDGS in the diet (27.2%). Similar trends were found for dry matter and gross energy digestibility, but there were no significant differences among treatments. In a subsequent trial, Leonard et al. (1975) fed diets containing corn, bluegrass hay, and DDGS at levels of 0%, 9.1%, and 18.2%, and found a linear increase in protein digestibility with increasing dietary levels of DDGS. There were no differences among dietary treatments for dry matter, cellulose, or gross energy digestibility. These authors concluded that DDGS contains some unidentified factors that stimulate cellulose digestion by the organisms present in the cecum of the horse, and that DDGS can be used effectively in horse diets.

Although horses can utilize the nutrients in DDGS quite well, one of the potential issues that could limit the use of DDGS in horse feeds is palatability. Equine are very sensitive to dietary inclusion of novel feed ingredients. Pagan (1991) conducted a series of feed preference and digestibility trials to determine the suitability of using DDGS as a feed ingredient for horses. In the feed preference trials, he fed horses pelleted diets containing 0%, 5%, 10%, or 20% DDGS in two tests over six consecutive days. Horses showed no preference differences between diets containing 0%, 5%, or 10% DDGS, and feeding the 20% DDGS diet was preferred more frequently than pellets containing lower levels of DDGS. These results suggest that DDGS can be used effectively in pelleted horse feeds at levels up to 10% of the diet, without any negative effects on palatability, while increasing the DDGS dietary inclusion level to 20% may actually increase feed preference. In the digestibility trials, protein digestibility tended to decrease as the level of DDGS increased in the diet, and dry matter digestibility was slightly depressed when horses were fed the 5% and 10% DDGS diets. However, fat and TDN (total digestible nutrients) digestibility was not different among diets containing varying levels of DDGS. Pagan (1991) concluded that DDGS appears to be a suitable ingredient for horses at inclusion rates up to 20% of the diet.

Hill (2002) evaluated eating behavior and feed intake responses of horses fed various proportions of wheat distillers grains and concentrate at ratios of 1:0, 0.75:0.25, 0.50:0.50, and 0:1. When wheat distillers grains were offered at a rate of 0.75 of dietary dry matter, and not soaked prior to feeding, there was a significant reduction in the rate of feed ingestion and the

number of chews per kg of dry matter. If the concentrate was soaked before feeding, there was an increase in the number of feeding bouts when 0.25 of the concentrate was replaced with wheat distillers grains. However, feed consumption processes were not affected until 0.5 of the concentrate dry matter was replaced with wheat distillers grains. Based upon these results, Hill (2002) concluded that wheat distillers grains can be used as a substitute for other energy and protein ingredients in horse rations, but the dietary inclusion rate depends on the method of presentation of the feed to the horse. Soaking of the concentrate before feeding reduces the level of the distillery by-product that can be incorporated into the ration in order to meet the desired amount of dry matter intake.

Rabbits

Very little research has been conducted to evaluate the feeding value of DDGS for rabbits. One study was conducted in Spain where researchers compared the nutrient digestibility of wheat bran, corn gluten feed, and DDGS in New Zealand White x Californian crossbred rabbits (Villamide et al., 1989). The basal diet contained a low energy content (2200 kcal/kg dry matter) and a high energy to protein ratio (25 kcal DE/g digestible protein). Although the fiber content of the diets was similar, energy and acid detergent fiber digestibility was highest for rabbits fed the DDGS diet (74.0% and 58.3%, respectively) compared to rabbits fed diets containing wheat bran (59.4% and 9.6%, respectively) and corn gluten feed (65.0% and 27.7%, respectively). Furthermore, rabbits fed the DDGS diet had the highest level of protein digestibility (70.1%) compared to rabbits fed the wheat bran (66.6%) and corn gluten feed (61.4%) diets. These results suggest that DDGS is a suitable ingredient for rabbit diets and provides more digestible energy, ADF, and protein than wheat bran and corn gluten feed.

Dogs and Cats

While there are no published scientific reports on incorporating DDGS into cat foods, there have been a few studies conducted that DDGS can be effectively used in dry, extruded dog foods. Studies were conducted at the University of Illinois (Allen et al., 1981) to evaluate nutrient digestibility of diets containing DDGS for both adult and immature Pointer dogs. Supplementation of diets with low levels (4 to 8%) of DDGS had no effect on the apparent digestibility of dry matter or starch by adult dogs. Adding moderate levels (16.1%) of DDGS to the diet decreased dry matter digestibility, but had no effect on starch or energy digestibility. Feeding diets containing high levels (26.1%) of DDGS decreased dry matter and energy digestibility, but had no effect on crude protein digestibility in adult dogs. Growing puppies that were fed diets containing a moderate amount (14.1%) of DDGS had lower dry matter and energy digestibility, but digested more acid detergent fiber compared to puppies fed diets that contained no DDGS. Nitrogen intake and fecal nitrogen were reduced by dietary DDGS supplementation, but there was no effect on urinary N, total N excretion, absorbed N, or N retention.

Additional research conducted by Corbin (1984) has shown that up to 10% DDGS can be included in diets for growing puppies to achieve good food intake and body growth (Table 1). Including DDGS in diets for older, more mature dogs can be very advantageous for controlling weight gains due to its high fiber content. Weigel et al. (1997) suggested that diets for mature dogs could include up to 25% DDGS depending on age and activity level to achieve good intestinal health.

Table 1. Effects of Feeding a Diet Containing 10% DDGS to Growing Puppies on Food Intake, Weight Gain, and Body Length.

| | <u>0% DDGS</u> | <u>10% DDGS</u> |
|-----------------------------|----------------|-----------------|
| No. puppies/treatment | 12 | 12 |
| Initial body weight, kg | 3.34 | 3.42 |
| Final body weight, kg | 10.15 | 10.28 |
| Food intake/10 weeks, kg | 21.34 | 27.96 |
| Weight gain, kg | 6.80 | 6.86 |
| Feed/Gain | 3.13 | 4.07 |
| Increase in body length, cm | 22.25 | 21.97 |

Conclusions

Based upon the limited research information available, it appears that DDGS is a very suitable ingredient for use in horse, rabbit, and dog diets. Current feeding recommendations are shown in Table 2:

| <u>Species</u> | <u>Maximum DDGS Inclusion Rate</u> |
|-----------------|-----------------------------------------------------------|
| Horses | Up to 20% of the diet |
| Rabbits | Up to 20% of the diet |
| Growing puppies | Up to 10% of the diet |
| Adult dogs | Up to 25% of the diet depending on age and activity level |

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