

## Chapter 27

# Use of DDGS in Horse and Companion Animal Diets

## Introduction

Very little research has been conducted related to feeding diets containing DDGS to horses and other companion animals. However, because of the increasing supply and availability of DDGS, the high quality and relatively low cost of U.S. DDGS produced today, and the low risk of mycotoxins, it is becoming a more popular ingredient for use in horse feeds and commercial pet foods.

## Horses

Researchers in Germany have estimated the digestible energy in distiller's co-products range from 11.5 to 14.2 MJ/kg (2,747 to 3,392 kcal/kg) of dry matter (DLG, 1995). The relatively high oil content in DDGS allows it to be an important energy source for performance horses (DLG, 1995; Orme et al., 1997). In the first of two studies, cellulose digestibility was 32.4% when DDGS was added directly into the cecum and 27.2% in the total tract of horses when fed diets containing up to 10% DDGS (Leonard et al., 1975). In a subsequent trial, there were no differences among dietary treatments for dry matter, cellulose, or gross energy digestibility when

horses were fed diets containing corn, bluegrass hay, and DDGS at levels of 0, 9, and 18% of the diet, but protein digestibility increased with increasing dietary levels of DDGS (Leonard et al., 1975). These results suggest a significant amount of the total digestible energy in DDGS is obtained from cellulose and DDGS may contain some unidentified factors that stimulate cellulose digestion in the cecum of horses (Leonard, 1975). However, when Pagan (1991) fed pelleted diets containing 0, 5, 10, or 20% DDGS to horses, protein and dry matter digestibility tended



to decrease on the level of DDGS increased in the diet, but fat and TDN (total digestible nutrients) digestibility was not different among diets with different DDGS levels. These results suggest DDGS is a highly digestible energy source for horses. Furthermore, due to the high concentration of protein and relatively high protein digestibility in DDGS, Frape (1998) showed DDGS can be an effective partial replacement for soybean meal or dried skimmed milk powder in horse feeds. Based on these results, it appears DDGS can be used effectively in horse diets at levels up to 20% of the diet.

Although horses can utilize the nutrients in DDGS quite well, palatability is one of the potential issues that could limit its use. 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, horses were fed 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 horses more frequently preferred the 20% DDGS diet compared with pellets containing lower levels of DDGS. These results suggest DDGS can be used effectively in pelleted horse feeds at levels up to 10% of the diet, without any negative effects on palatability, and increasing the DDGS dietary inclusion level to 20% may actually increase feed preference.

Hill (2002) evaluated eating behavior and feed intake responses of horses fed various proportions of wheat distiller's grains and concentrate at ratios of 1:0, 0.75:0.25, 0.50:0.50, and 0:1. When wheat distiller's 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 distiller's grains. However, feed consumption processes were not affected until 0.5 of the concentrate dry matter was replaced with wheat distiller's grains. Based upon these results, Hill (2002) concluded that wheat distiller's 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 feed presentation to the horse. Soaking of the concentrate before feeding reduced the level of the distiller's co-product that could be incorporated into the ration to meet the desired amount of dry matter intake.

Very little information is known about the effects of feeding DDGS diets on horse performance. In a recent study by Bonoma et al. (2008), weanling horses were fed completely pelleted diets consisting of 50% alfalfa and 50% concentrate containing either corn and soybean meal or 30% of the concentrate replaced with DDGS. Growth rate and feed conversion were not different between the two dietary treatments. However, feeding the DDGS diet resulted in reduced dry matter, protein, acid detergent fiber, and neutral detergent fiber digestibility compared to feeding the corn-soybean meal concentrate. Therefore, for weanling horses, no more than 30% of the concentrate or 15% of the total diet should be replaced with DDGS when alfalfa is used as the forage source and comprising 50% of the diet. If a forage source that is lower in quality than alfalfa is used, it may be advisable to use less DDGS as a partial substitute for corn and soybean meal in concentrates fed to weanling horses.

## 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 amount of energy (2200 kcal/kg dry matter)

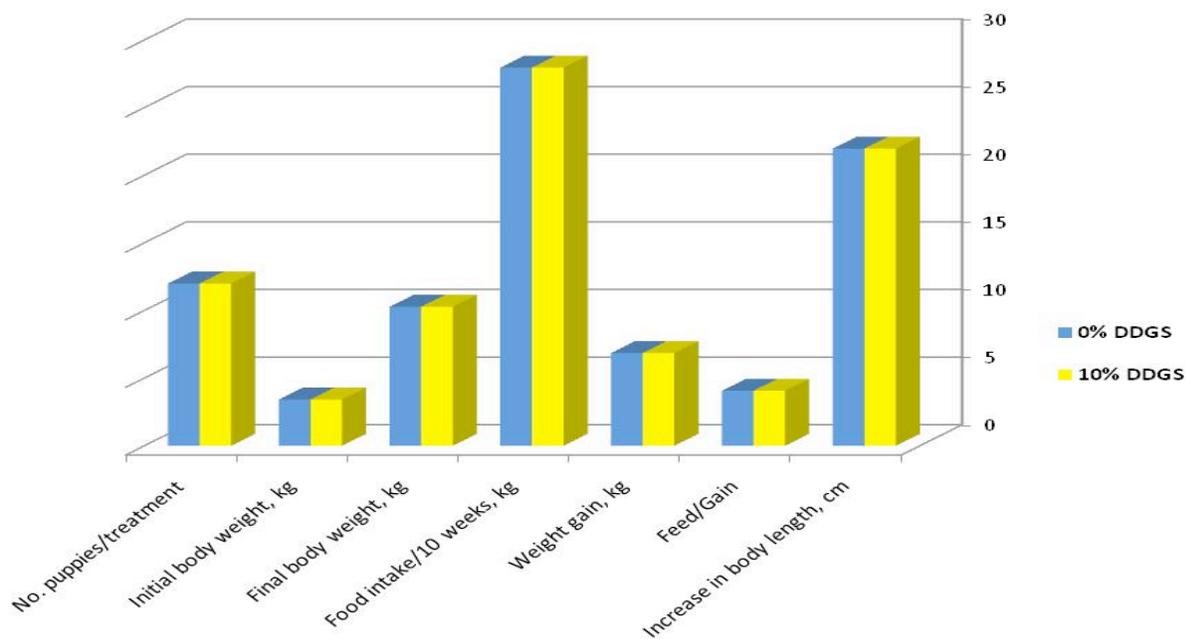


and a high energy to protein ratio (25 kcal DE/g digestible protein). Although the fiber content of the diets was similar, energy and acid detergent fiber digestibility was highest for rabbits fed the DDGS diet (74.0% and 58.3%, respectively) compared to rabbits fed diets containing wheat bran (59.4% 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 DDGS is a suitable ingredient for rabbit diets and it 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 showing 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 and starch by adult dogs. Adding moderate levels (16.1%) of DDGS to the diet decreased dry matter digestibility, but had no effect on starch and 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 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 containing no DDGS. Nitrogen intake and fecal nitrogen were reduced when DDGS was supplemented in the diet, but there was no effect on urinary nitrogen, total nitrogen excretion, absorbed nitrogen, or nitrogen retention.

Research conducted by Corbin (1984) has shown DDGS can be added at rates up to 10% of the diet for growing puppies to achieve good food intake and body growth (**Figure 1**). Including DDGS in diets for older, more mature dogs can be advantageous for controlling weight gain due to its high fiber content. Weigel et al. (1997) suggested diets for mature dogs could include up to 25% DDGS depending on age and activity level to achieve good intestinal health.



**Figure 1. Effects of feeding a diet containing 10% DDGS to growing puppies on food intake, weight gain, and body length.**

## Conclusions

Based upon the limited research information available, it appears DDGS is a very suitable ingredient for use in horse, rabbit, and dog diets. Current feeding recommendations are shown in **Table 1**.

**Table 1. Recommended maximum dietary inclusion rates for DDGS in diets for horses, rabbits, and dogs.**

Species	Maximum DDGS Inclusion Rate
Horses (mature)	Up to 20% of the diet
Horses (weanling)	Up to 15% of the diet depending on forage quality
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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