

Basic Studies on the Effect on Layer Hens of DDGS Produced in USA

September 30, 2005

Laboratory of Veterinary Nutrition

Nippon Veterinary and Animal Science University

Objectives

In USA, the demand for fuel ethanol has been increasing with the adoption of measures for reducing air pollution from automobile exhausts. As a result, a number of new ethanol plants that use cereals (mainly corn) as feedstock have been established, and existing ones scaled up. Corn Distiller's Dried Grains with Solubles (DDGS), a byproduct of ethanol production, is rich in proteins and fats and is currently used in USA as a feed for domestic animals and poultry. About 10% of DDGS in the feed is suitable for hens, according to the results of some experiments on egg production. There are still only a few reports on feeding studies carried out in Japan and much more information is needed for regular use of DDGS as a feed ingredient.

We carried out basic feeding studies to examine the effect of feeding DDGS from the US to the most commonly reared layer breed in Japan, on the egg quality and fat metabolism. DDGS was added to a commercially obtained feed of Japan, where there is a demand for eggs with stronger yolk color than in the US.

Summary

1. Basic feeding studies were conducted at the Laboratory of Veterinary Nutrition, Nippon Veterinary and Animal Science University (Tokyo) to examine the effects of feeding USA-made DDGS mainly on the egg quality and fat metabolism in White Leghorn Julia strain hens, the most commonly reared layer breed in Japan. DDGS was added to a commercially obtained feed of Japan, designed to enhance the yolk color to meet the local demand for stronger yolk color than in the US.
2. There were a total of 5 groups. The control group was given the commercially obtained layer feed alone. The other groups were given the commercial layer feed containing 10% DDGS, 20% DDGS, 10% CS (a 1:1 mixture of crushed corn and soybean cake, similar to DDGS in protein and metabolizable energy content) or 20% CS.
3. The 100g of feed given per hen per day was fully consumed in all the treatment groups. This suggested that the use of up to 20% DDGS did not adversely affect the palatability of the feed for the hens.
4. The body weight decreased in all treatment groups throughout the treatment period. This decrease was greater in treatment groups given feed containing high percentage of DDGS or CS. This appears to be the negative effect of diluting the basic feed with these substances. The weight of individual eggs did not

differ among the control and treatment groups, but egg production showed a decreasing trend in the 20% DDGS group. This reduced the total weight of eggs produced in the DDGS group.

5. The feeds had no effect on the eggshell strength. 20% DDGS in the feed had no effect on the Haugh Unit (HU) either. The color of the egg yolk was significantly affected by the feed. The color was reduced in the treatment groups immediately after switching over to the test feeds. The color recovered rapidly in the DDGS groups, reaching the level of control group in about 10 days. In the CS groups, however, the color did not recover and was lighter almost proportionately to the amount of CS in the feed. The results suggested that feed containing 10% or 20% of DDGS had almost the same yolk coloring effect as the basic feed containing paprika added to enhance yolk color.
6. The plasma triglyceride concentration clearly decreased after feeding DDGS, suggesting a decrease in lipid synthesis in the liver. Among the organs related to lipid metabolism, the liver and ovary had a higher weight in the DDGS groups, whereas the weight of their abdominal adipose tissues tended to be low. The treatment groups did not differ in the fat content of adipose tissue but the 20% DDGS group showed the highest fat content in the ovary (follicles) and abdominal adipose tissue. In the DDGS groups, fat accumulation was generally less in the liver and abdominal adipose tissue and high in the ovary, suggesting that fat was mobilized into the egg yolk from an early stage.
7. **The above findings suggest that DDGS can be used in the feed of layer hens without affecting egg weight and quality, provided the amino acid, vitamin and mineral contents are adjusted to the levels in ordinary feed; its use improves egg yolk color (leading to saving of yolk coloring agent), mobilizes the fat in it into the egg yolk rather than accumulating it as body fat, and is unlikely to reduce egg production as it has only a small effect on the accumulation of body fat in the early to mid-stage of egg laying.**