

Can Fractionation Technology Enhance the Nutritional Value of Wheat DDGS for Poultry?

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Problem

Wheat distillers dried grains with solubles (DDGS) is a co-product of grain-based ethanol production in Western Canada and other jurisdictions where wheat (rather than corn) is the predominant feedstock.

While wheat DDGS contains high levels of crude protein, it also contains high levels of fibre, which may limit its usefulness as a feedstuff for poultry. Fractionating DDGS could yield lower-fibre DDGS fractions that have improved nutritional value for poultry relative to the parent stock DDGS.

Our objective therefore was to determine nutrient digestibility in the different wheat DDGS fractions produced using a two-step dry fractionation method.

Our Approach

We used a two-step dry fractionation procedure to produce several wheat DDGS fractions. The first step involved separating material by particle size using a SWECO ZS30 vibro-separator (Figure 1A). Material not passing through the sieve was then separated by weight using a Westrup LA-K gravity separation table (Figure 1B).



Figure 1. SWECO ZS30 vibro separator (A) and Westrup LA-K gravity separation table (B) used sequentially to produce wheat DDGS fractions for the present study.

From this process 4 fractions were produced but only 3 were used in the subsequent broiler digestibility study (Table 1).

Table 1. Analyzed composition of wheat DDGS and 3 wheat DDGS fractions produced using a two-step dry fractionation process.

| Nutrient, % | Wheat DDGS | Fraction 'A' | Fraction 'C' | Fraction 'D' |
|-------------------------|------------|--------------|--------------|--------------|
| Crude Protein | 32.3 | 52.7 | 38.0 | 31.9 |
| Crude Fibre | 6.7 | 5.2 | 10.6 | 13.2 |
| Acid Detergent Fibre | 16.7 | 11.0 | 14.1 | 16.7 |
| Neutral Detergent Fibre | 38.7 | 27.6 | 43.4 | 44.2 |

Apparent ileal digestibility (AID) of amino acids (AA) in the parent stock DDGS and DDGS fractions A, C and D were then compared in a 21-d digestibility study. Test diets containing 30% of the DDGS or respective DDGS fractions were fed to 14-d old broilers, who were then sampled at 21d of age to calculate AID coefficients for each AA.

Our Observations

Based on the differences in fibre content we had anticipated differences in AA digestibility among the DDGS fractions and the parent stock DDGS. No such differences however were observed (Table 2).

Table 2. Apparent ileal digestibility coefficients (%) for crude protein and essential amino acids in wheat DDGS and 3 fractions in 21-d old broilers.

| Nutrient, % | Wheat DDGS | Fraction 'A' | Fraction 'C' | Fraction 'D' | SEM |
|-------------------|------------|--------------|--------------|--------------|-----|
| Crude Protein | 87.0 | 78.9 | 80.9 | 85.5 | 4.4 |
| Lysine | 75.9 | 67.7 | 70.2 | 78.1 | 6.1 |
| Methionine | 87.8 | 84.1 | 82.6 | 90.2 | 4.8 |
| Met + Cys | 85.8 | 80.0 | 78.8 | 86.7 | 5.4 |
| Threonine | 80.0 | 74.1 | 72.8 | 82.5 | 5.6 |
| Arginine | 88.2 | 84.2 | 83.4 | 89.4 | 3.4 |
| Tryptophan | 85.3 | 73.1 | 80.0 | 84.9 | 5.0 |
| Total Amino Acids | 87.0 | 81.7 | 81.2 | 87.9 | 4.6 |

What Does This Mean?

The results of this study suggest:

1. Fibre content of the DDGS fractions did not appear adversely impact AA digestibility coefficients
2. The major benefit of fractionation is increasing the concentration of AA in the feedstuff without impacting digestibility
3. Ethanol producers could easily use a scaled up version of our fractionation procedure as an end step in the DDGS production process to create DDGS with higher protein content for poultry

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