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The Influence of Dried Distillers' Grains on Carcass Fat in Swine

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Introduction

One of the fastest moving by-products from the production of ethanol in the Midwest is dried distiller's grains with solubles (DDGS). As shown in other Purdue Extension BioEnergy publications <http://www.ces.purdue.edu/bioenergy/>, DDGS have high protein and fat content and can be included into a number of livestock and poultry diets. The fat component of DDGS is essentially concentrated corn oil and is known to affect carcass fat softness.

Dietary Intake and Pig Body Composition

Dietary intake plays a major role in determining pig body composition, specifically fat composition, because pigs can directly deposit dietary fat into their fat depots. This transfer from diet to body fat is well characterized in grow-finish pigs.

Saturated fatty acids tend to positively influence fat quality by increasing firmness when included in the diet. Conversely, unsaturated fatty acids all tend to negatively affect fat by causing it to have a softer composition. (See Figure 1 for an example of a very firm pork belly and a very soft belly.) Carcasses high in unsaturated fat acids are characterized by higher levels of oxidation, slicing, and processing difficulties.

One way to monitor fat firmness is by determining the fatty acid profile and calculating an iodine value (IV). Once the fatty acids have been identified, the IV formula can be applied as follows:

IV = (% C16:1 * 0.950) + (% C18:1 * 0.860) + (% C18:2 * 1.732) + (% C18:3 * 2.616) + (% C20:1 * 0.785) + (% C22:1 * 0.723).

Acceptable IV values vary depending on the processor; however, an IV value over 70 frequently indicates soft fat and a less desirable carcass. Our laboratory has recently published that the relative abundance of saturated to unsaturated fatty acids may be the best predictor of soft fat tissue, but regardless of method, the processor wants non-soft fat tissue in pigs.

DDGS and Pig Fat

So, how does DDGS play a role in pig fat? Again, the fat component of DDGS is concentrated corn oil. So the abundance of C18:2n6 (commonly known as "linoleic acid"), the primary fatty acid of corn, is very high and a strong contributor to soft fat, as shown in the IV calculation.

Figure 1. *Example of a Very Firm Pork Belly, #502 vs. Very Soft Belly, # 507*

In the calculation, (C18:2 is multiplied by 1.732), so if the other fatty acids remain somewhat constant and this one increases by 1.5-fold, then the outcome of IV will go up strongly. Normally, linoleic acid is around 12% of all the fatty acids in pigs (essentially 12 * 1.732 = 20.78 is the contribution by linoleic acid alone), but when linoleic acid content is increased by 1.5 fold in the carcass through manipulations of diet, one can essentially add 11 IV to the carcass (18% linoleic acid times 1.732 = 31 points—the 20.78 IV points in normal carcass).

Conclusion

Our research and that done by others does indicate that adding DDGS 10, 20, 30 or 40% will increase carcass IV, and we believe it's through the relative increase in the level of linoleic acid being consumed. To illustrate the relative change in "soft belly" fat, see <http://ag.ansc.purdue.edu/poultry/Fatwork/Belly.htm>, where animals were given no DDGS and 10, 20, or 30% DDGS.

We believe from that study along with other work done, that an optimum range for feeding DDGS will most likely be less than 20% inclusion, because that's the point where we notice bellies to be very soft and we normally realize a 7-10 IV point increase. Alternatively, the animals will need to be fed something that counteracts the effects of DDGS, namely Conjugated Linoleic Acid (CLA). We have seen through adding 1% CLA to pig diets that we can reduce 5-6 IV points off a pig carcass that had been consuming DDGS.

Thus, feeding DDGS, a common byproduct of ethanol production, to pigs at concentrations of 20% and above will require addition of CLA to the diet in order to maintain acceptable carcass fat firmness. Another important component in feeding DDGS is that all pigs are not equal in terms of fat composition independent of diet. That is, the leaner the genetic population is, the greater the extent to which the pigs' fatty acid profile will be more unsaturated, meaning higher IV, so producers with super genetic lean pigs may need to feed less DDGS compared to other breeds. Additional research must be performed in this area.

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