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36 Effects of grinding method on ileal digestibility of amino acids in different short-season corn cultivars fed to growing pigs. Jinyoung Lee, Martin Nyachoti, University of Manitoba

Abstract: Decreased corn production was previously observed in Manitoba due to the low climatic temperatures; however, corn production has increased by developing corn hybrids that require low corn heat units, and therefore can grow in areas with decreased heat units. Milling technology affects feed particle size and shape, which may affect the digestibility of nutrients and growth performance of pigs. Therefore, this study aimed to determine the effects of grinding methods on the apparent (AID) and standardized (SID) ileal digestibility of amino acids (AA) in selected short-season corn cultivars fed to growing pigs. A total of 18 ileal cannulated barrows (56.8 ± 2.9 kg) were assigned to 1 of 6 dietary treatments in a triplicate 6 × 2 incomplete Latin square design with 6 diets and 2 periods to give 6 observations per treatment. Dietary treatments were arranged in a 3 × 2 factorial design with three different corn cultivars [two Manitoba-origin short-season corns (A or B) or a US-origin corn] and two grinding methods [hammer mill or roller mill]. Each ingredient was included as the sole source of protein in the diets. All diets contained 0.3% titanium dioxide as an indigestible marker. Each experimental period lasted 7 d including the first 5 d for adaptation and the last 2 d for ileal digesta collection. After feeding the experimental diets, all pigs were fed a low-protein diet for 7 d to quantify endogenous losses of N and AA for determining the SID of N and AA. Pigs were fed the diets at 2.8 times the maintenance energy requirement based on their body weight at the beginning of each period. Data were analyzed using the PROC MIXED of SAS. The statistical model included diet as fixed effect and replication, animal within replication, and period within replication as random effects. The AID of Arg, Ala, Ser, and Gly were greater \((P < 0.05)\) in short-season corn B compared with US-origin corn. The AID and SID of His in both short-season corns were greater \((P < 0.05)\) than in US-origin corn. The AID of His and SID of Thr in hammer-milled corns were greater \((P < 0.05)\) than in roller-milled corns. A significant interaction was found whereby AID of Ile in hammer-milled corn was not different between short-season corn B cultivar and US-origin corn but in roller-milled corn, short-season corn B cultivar had a greater \((P < 0.05)\) digestibility than US corn. In conclusion, the digestibility of AA was greater in short-season corn than in US corn, and pigs had greater digestibility of AA in hammer-milled corn than roller-milled corn.

Keywords: amino acid, grinding method, short-season corn
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Methionine, via S-adenosylmethionine, has an important role in the post-translational methylation of Arg, Lys, and His in proteins, methylation of DNA and RNA, and methylation of serotonin (to melatonin), noradrenaline (to adrenaline), and guanidinoacetate (to creatine). After the methyl-group of Met is transferred to an acceptor, the resulting homocysteine can transfer its sulfur group to Ser yielding Cys. Homocysteine can also be remethylated back to Met in the so-called Met salvage pathway, which requires betaine or N5-methyl tetrahydrofolate (THF) as a 1-carbon donor. Methionine is, thus, not necessarily the dietary source of 1-carbon in methylation reactions. N5-methyl THF is one of the “1-carbon flavors” of THF and the metabolism of Ser, Gly, His, and formate (e.g., from Trp catabolism) results in the formation of 1-carbon metabolites linked to THF. These amino acids (and choline and betaine) are thus potential dietary sources of 1-carbon groups, of which only Ser and Gly can be synthesized de novo. In recent years, there has been an increased interest in the role of Ser and Gly in 1-carbon metabolism. Glycine has the unique property that it is able to accept and donate 1-carbon groups and the high concentration of Gly in plasma may be indicative for its 1-carbon buffering capacity. Glycine is also one of the few non-essential amino acids for which the retention (e.g., for collagen synthesis) largely exceeds the dietary intake. However, the de novo synthesis of Gly has been considered “a weak link in metabolism” because it is always associated with the synthesis of a 1-carbon group, and the capacity of the animal to dispose of excess 1-carbon groups may be limited. An excess supply of 1-carbon groups may therefore lead to a dietary requirement for Gly.

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DPP Lecture: Evidence of methionine effects on health and immune response of animals.

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Abstract: Methionine is an essential amino acid that is commonly supplemented in livestock diets, including for swine and poultry. As with other amino acids, requirements for methionine have largely been based on maximizing growth performance; however, there is evidence that nutrient requirements, including for sulfur amino acids, are altered by immune status of the animal. As such, there has been significant interest in exploring the non-proteinogenic functions of amino acids and how these work to support animal health in addition to growth performance. While methionine has a key role in protein synthesis, it is involved in numerous biological functions, including participation in transsulfuration and transmethylation pathways, as a precursor of intermediates in metabolic pathways (e.g., carnitine, cystine), and in components of the immune response (e.g., acute-phase proteins), and in antioxidant status (i.e. glutathione, taurine). While undersupply and oversupply of methionine can lead to deficiency and toxicity, respectively, it is likely that supplementation with methionine above the current recommendations for growth would be beneficial for animal health, especially during times of stress or immune stimulation.