

Off-quality wheat: Utilization in swine diets

Off-quality wheat that cannot be used by the flour milling industry can be utilized in swine diets. However, this type of wheat is often associated with physical abnormalities or contamination that affect its nutritional value compared to regular wheat. This fact sheet discusses common off-quality wheat occurrences and how they can be utilized most effectively in swine diets and the subsequent impact on performance.

Sprouted wheat

Poor weather conditions can result in germination and sprouting of wheat kernels before they are able to be harvested (Thomason et al., 2019). Sprouted wheat kernels are not suitable for the flour milling industry and therefore can be priced at a discount.

Activity of α -amylase, which is responsible for starch breakdown, increases in sprouted wheat (Simsek et al., 2014). Therefore, the energy content of sprouted wheat may decrease depending on the severity of sprouting. It has been reported that feeding wheat that contains 20, 40, and 60% sprouted kernels results in 3.9, 6.8, and 7.8% poorer feed efficiency in weanling pigs, respectively (Murray and Huber, 1968). It may be beneficial to blend sprouted wheat with non-sprouted wheat to lessen the impact on pigs.

When grinding sprouted wheat kernels, there tends to be more accumulation of fine wheat particles (Dziki et al., 2010). Therefore, average particle size may be lower in sprouted wheat than non-sprouted wheat even if the target is the same. It therefore may be advantageous to grind sprouted wheat to a coarser particle size target.

Low test-weight wheat

Poor growing conditions, high moisture during the growing season, insect damage, and sprout damage can result in low test-weight wheat (Wang and Fu, 2020). Normal wheat test weight is typically around 58 to 60 lb/bu depending on the class of wheat. Low test-weight wheat is characterized at or below 51 lb/bu (Jones et al., 2019). Low test-weight wheat is often a result of incomplete starch deposition in the wheat kernel (Lalman and Highfill, 2002). Pigs fed wheat with a test weight of 51 and 45 lb/bu resulted in 6 and 8% poorer feed

efficiency, respectively, compared to pigs fed wheat with a test weight of 59 lb/bu (Hines and Pollman, 1982). Therefore, wheat's energy content should be decreased by approximately 5% when bushel weight is 51 lb or lower.

Mycotoxin-contaminated wheat

Mold growth on wheat can produce mycotoxins that can diminish pig performance depending on the type and concentration of mycotoxin present. The most common mycotoxins present in wheat in the U.S. is deoxynivalenol (DON). Performance of pigs appears to be unaffected when DON contamination of a wheat-based diet is below 1 mg/kg. When above this concentration, each 1 mg/kg increase in a DON contaminated diet results in a 11 and 6% reduction in ADG and ADFI for nursery pigs, respectively. For finishing pigs, each 1 mg/kg increase in a DON contaminated diet results in a 2.6 and 2.7% reduction in ADG and ADFI, respectively.

Other mycotoxins that may be present in wheat include zearalenone, ochratoxin A, fumonisin, aflatoxin, and ergot alkaloids. All can diminish performance in pigs depending on the concentration present in wheat. In breeding swine, zearalenone is of most concern because of its substantial effects on reproduction (Jiang et al., 2011). Aflatoxin is the only mycotoxin that has a mandatory action level set by the FDA. Wheat and wheat co-products intended for swine must contain less than 20 μ g/kg aflatoxin and can't legally be blended to decrease the concentration (FDA, 2000).

To reduce potential mycotoxin contamination in wheat, avoid post-harvest moisture exposure that can initiate mold growth. If mycotoxins are found to be present in wheat, contaminated wheat can be blended with uncontaminated wheat to fall below guidance levels established by the FDA when allowed. Commercial mycotoxin mitigants can also be used to lessen the negative effects on pigs. Mycotoxin contaminated wheat should be fed to less sensitive pigs such as finishing pigs or potentially other species.

Mycotoxin contamination is of greatest concern during periods of stress on wheat. Typically, this is associated with drought or hail, damaged wheat, followed by rain before harvest.

More information about nutritional characteristics associated with off-quality wheat is described by Stas et al. (2024).

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