FOOD SAFETY AND TOXICOLOGY

DEVELOPMENT OF DEOXYNIVALENOL (DON) AND DON-3-GLUCOSIDE DURING MALTING OF *FUSARIUM* INFECTED HARD RED SPRING WHEAT

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ABSTRACT

The behavior Fusarium Head Blight (FHB) and fate of Deoxynivalenol (DON) during the malting and brewing of barley has been extensively investigated over the past 20 years. However, there is little to no information on wheat malt. This is of interest as the use of wheat by the brewing industry is growing as the result of the craft brewing segment, and also several successful wheat beers that are produced by the larger brewing companies. In addition, the growing craft malting industry makes extensive use of locally produced wheat, often from areas that are prone to FHB. The objective of this study was to assess the growth of *Fusarium* and the development of DON and DON-3-glucoside (DON-3-G) during the malting process. Twenty hard red spring (HRS) wheat samples from the 2015 crop in North Dakota were selected to provide a range in DON content (0.02-17.92 µg/g). The samples were micro-malted in duplicate following 2 and 6 months of storage at room temperature. DON was determined by GC-MS, DON-3-G by LC-MS and *Fusarium* DNA by real-time PCR. When malted shortly after harvest (2 months) levels of DON were observed to increase in all the samples (15) which had DON above the limit of quantitation (LOQ). The average increase was 560% over levels seen in the unmalted grain, but results varied from 113 to 1820 %. The increase in DON levels can be attributed to growth of *Fusarium* during malting, and DNA levels were observed to rise from an average of 1.4 pg/g on the wheat to 4.0 pg/g on malt. However, it also appears that a large portion of the DON was converted by the germinating wheat to DON-3-G. Consistent with other reports in the literature, levels of DON-3-G in the sound wheat were quite low, and were above the LOQ in less than half the samples. The ratio of DON-3-G/DON was approximately 20 mol% in wheat, but increased to 60 mol% in the malt. The samples were malted a second time following 6 months of storage. As expected there were no significant differences in the levels of DON for the most of ungerminated wheat samples when compared to the previous tests. However, increases were observed for 5 of higher DON samples. The amount of DON detected on malt after six months of storage was lower than that found on the unmalted wheat for approximately half the samples. This suggests some decrease in viable *Fusarium* following storage. Levels of DNA measured on the malt (average 1.76 pg/g) at 6 months were in fact generally lower than those detected with the previous malting (2 months). However, levels of DON-3-G produced during the second malting were not greatly different than those from the first, illustrating that storage likely does not influence the capacity of wheat grain to convert DON during malting.

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