

Retention of *Fusarium* mycotoxins zearalenone and deoxynivalenol during Japanese soft wheat milling

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Abstract

Zearalenone (ZEA), which often co-occurs with another *Fusarium* mycotoxin deoxynivalenol (DON), is one of the major natural contaminants of wheat. To elucidate the retention of ZEA after processing of wheat and to compare that of DON, experimentally *Fusarium*-infected grains of Japanese soft wheat were subjected to milling, and the concentration of ZEA in a semi-processed wheat product (wheat flour) was analyzed. The grain was milled to obtain three breaking flours (1B, 2B, 3B), three middling flours (1M, 2M, 3M) and two outer layer fractions (bran and shorts). Straight flour was made from all six flours, and patent flour for human consumption was made from flours 1B, 1M, 2B and 2M. The contents of ZEA in straight flour, patent flour, bran, and shorts were determined using an in-house validated analytical method with multifunctional cartridge clean-up and HPLC-fluorescence detection. The content of DON in the same fraction was also determined. Less than 50% retention of ZEA was observed in straight flour, which was much smaller than that of DON. A greater reduction of ZEA in patent flour was observed, which demonstrated the effectiveness of flour fractionation in eliminating ZEA.

Keywords : retention, straight flour, patent flour, zearalenone, deoxynivalenol

I Introduction

Wet and temperate weather during wheat plant flowering often results in scab or *Fusarium* head blight, a fungal disease caused by several *Fusarium* species including *F. graminearum* (*Gibberella zeae*). This disease induces two forms of agricultural damage: a reduction in harvest due to grain shriveling and a threat to food safety due to the accumulation of mycotoxins in the grains. Among such *Fusarium* mycotoxins, deoxynivalenol (DON) (Fig. 1) is considered to be the most important hazard of wheat worldwide¹⁾. In Japan, the tentative regulatory limit for DON in unprocessed wheat grain was set as 1.1 µg/g in 2002²⁾. This value includes the following assumption obtained in foreign wheat cultivars: the DON level will be reduced by half in the final product through wheat grain processing.

Zearalenone (ZEA), another *Fusarium* mycotoxin (Fig.

1), is a non-steroidal estrogenic mycotoxin that often co-occurs with DON in *Fusarium*-infected wheat³⁾. The detailed mechanism of ZEA toxicity is not completely understood, but it is implicated in reproductive disorders of farm animals and occasionally in hyper-estrogenic syndromes in humans⁴⁾. No regulatory limit for ZEA in food has been set in Japan to date,

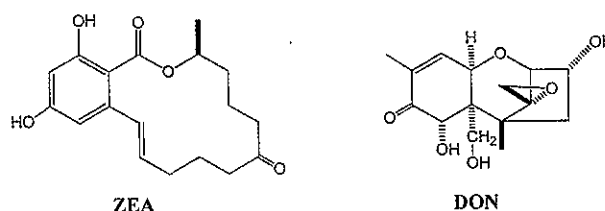


Fig. 1. Chemical structures of zearalenone (ZEA) and deoxynivalenol (DON)