

## Retention of zearalenone during cooking of noodles made from a Japanese soft wheat

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### Abstract

The precipitation during wheat anthesis can result in *Fusarium* head blight (FHB) in the ear of wheat and causes not only yield loss of grains but also mycotoxin accumulation in grains. Zearalenone is one of the major *Fusarium* toxins and known as an estrogenic mycotoxin. To assess the retention of zearalenone in processed foods of wheat, a patent flour sample prepared from *Fusarium*-damaged Japanese soft wheat was subjected to noodle cooking, and the contents of zearalenone before and after cooking were analyzed. The contents of zearalenone in raw noodle, boiled noodle, and broth were determined using an in-house validated analytical method with multifunctional cartridge clean-up and HPLC-fluorescence detection. In this sample, the substantial retention of zearalenone in the boiled noodle was 83%. More than two-times as much distribution of zearalenone as that in broth was observed in boiled noodle. As a result, it was shown that boiling was not effective to remove zearalenone from raw noodle.

**Keywords** : *Fusarium* head blight, zearalenone, raw noodle, boiled noodle, broth

## I Introduction

Outbreaks of *Fusarium* head blight (FHB) of small grain cereals causes significant economic losses of wheat and barley worldwide. Japan is not an exception of these outbreaks because *Fusarium* fungi responsible for FHB (*F. graminearum* species complex) prevail all over the world including Asia, and wet and temperate weather during flowering is favorable for fungal propagation<sup>1)</sup>. FHB induces two forms of agricultural damage: a reduction in harvest due to grain shriveling and a threat to food safety due to the occasional accumulation of mycotoxins in the grains<sup>2)</sup>. Among such *Fusarium* mycotoxins, deoxynivalenol (DON) is considered to be the most important hazard of wheat and the retention of DON during processing is well studied<sup>3)</sup>. In Japan, the tentative regulatory limit for DON in unprocessed wheat grain was set as 1.1 µg/g in 2002. This value is based on the assumption that the DON level will be reduced by half in the final product through wheat grain processing<sup>4)</sup>.

Zearalenone is another *Fusarium* mycotoxin that often co-occurs with DON in FHB-infected wheat<sup>5)</sup>. The mode of action of zearalenone toxicity is not completely understood, but it is implicated in reproductive disorders of farm animals and occasionally in hyper-estrogenic syndromes in humans<sup>6)</sup>. The risk of zearalenone assessed by JECFA is considered to be similar to that of DON because the provisional maximum tolerable daily intake for zearalenone and DON including its acetylated derivatives are 0.5 µg/kg body weight/day and 1 µg/kg body weight/day, respectively. For the settlement of the regulation level for zearalenone, the retention of zearalenone through processing should be clarified, however; studies using Japanese wheat cultivars were limited and only focused on milling<sup>7, 8)</sup>. Since most of Japanese wheat cultivars are for noodle making, to assess the retention of zearalenone in the final product, it is required to analyze the retention of zearalenone after milling followed by noodle cooking.

Previously, we analyzed the retention of zearalenone in patent flour (a fraction for human consumption) after milling,