Assesment of Wheat Grain Fractionation Process Involvement in the Product Contamination with Deoxynivalenol (DON)

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Introduction

DON is one of the secondary metabolites produced by certain species of *Fusarium* fungi infecting cereal grains. Its presence in wheat products consumed by humans and animals is considered as an important sanitary issue in Europe*.
Several ways for controlling and/or reducing DON contamination are under development: selection of resistant cultivars; knowledge of the environmental factors; and potential impact of fractionation steps as this latter leads to the consumed end-products.

In this study, 2 naturally contaminated durum wheat (Acalou cultivar) batches, with distinct DON content, were processed using a 1/2-industrial mill. DON concentrations in the outcoming fractions of the 2 batches were determined to assess the milling process impact on the product contamination. *F. graminearum* was also detected by PCR in the milling fractions.

Materials and Methods

Grains were tempered to 17% water content before milling. The milling fractions:

- 6 semolinas and total semolina fraction
- 4 break flours and 4 reduction flours
- 4 brans (1 coarse, 2 fine and 1 short)

were analysed for DON (purification on Mycosep® 225 column, separation by RP-HPLC and UV detection and quantification) and ash (AOAC method 08-12) contents. DNA was extracted using DNeasy Plant Mini kit (Qiagen) and amplified by PCR using primers corresponding to tri5 gene involved in the toxin synthesis.

Results and Discussion

Table 1. Yield (%), DON (µg/kg) and ash (% dm) contents of milling fractions from durum wheat batches.

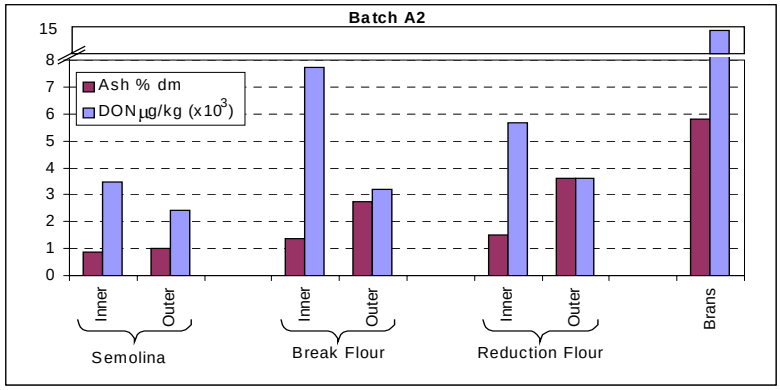
	Batch A1			Batch A2		
	Yield %	DON µg/kg	Ash % dm	Yield %	DON µg/kg	Ash % dm
Wheat Grain		382	1.9		4204	1.8
Total Semolina	76.4	220	0.9	75.9	2940	1.0
Total Break Flour	3.2	601	2.0	3.3	5215	1.9
Total Reduction Flour	3.7	385	2.2	4.2	4533	2.4
Brans	16.8	1202	5.6	16.6	11835	5.8

CV: ash<1%, DON<10%

Between the two batches:

- the yield of milling fractions was similar
- bran fractions were the most contaminated
- break flours showed higher DON content than reduction flours
- DON concentration of total semolina compared to that of grain was found higher in the batch A2 (ratio 0.7 versus 0.6 for batch A1).

Figure 1. DON (µg/kg) and ash (% dm) contents versus the type of milling fraction.



The DON and ash contents varied depending on the type of milling fraction, both being for instance higher in brans.

However, comparison between ash and DON contents in the other fractions did not show any relationships. For example, in the case of break flours, the fraction coming from the "inner" part of grains showed a higher DON content and lower ash content.

Figure 2. Detection *of F. graminearum* in the milling fractions by PCR.

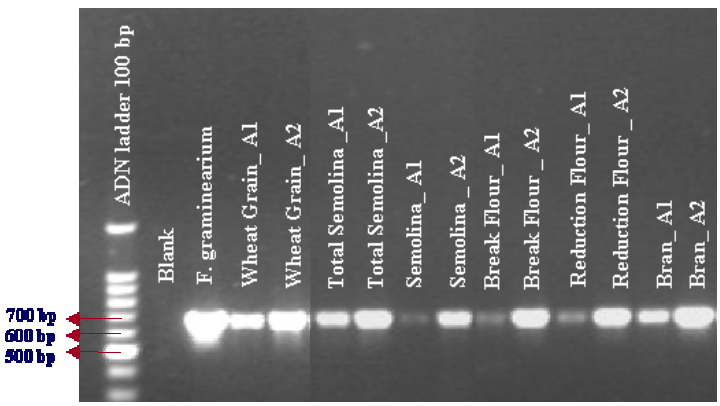


Figure 2 showed that *F. graminearum* presence was detected in all milling fractions of both batches.

Conclusions

Even if the outer wheat tissues are the most contaminated by DON, absence of relationship between ash and DON content in the other milling fractions and especially in fractions coming from the outer part of the grains suggests than DON contamination was not only related to the histological origin of the fraction.

Furthermore, *F. graminearum* was also detected in the most inner part of wheat grains. Therefore, the influence of each milling operations as well as the different fungi penetration in wheat grain have to be explored to understand the DON distribution in the products.

***EC regulation N° 856/2005 defined the maximum authorised content in grains and derived products**

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