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Cadmium and Deoxynivalenol in durum wheat grains: physiological and biological basis of the co-contamination

Florence Richard-Forget, Vessela Atanasova-Penichon, Sylvain Chéreau, Jean-Yves Cornu, Christine Ducos, Valerie Nicaise, Laetitia Pinson-Gadais, Nadia Ponts, Marie-Noëlle Verdal-Bonnin, Quentin Gras

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April 8 – 11, 2018
Minoritenkloster
Tulln, AUSTRIA

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PP-83 Changes in expression of stress-responsive genes in *Fusarium proliferatum* exposed to host plant extracts

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Stress factors (biotic or abiotic) are critical players in functional characteristics of plant-pathogenic fungi. Our previous studies have shown that *Fusarium proliferatum*, a casual fungal pathogen, besides increased fumonisin biosynthesis, activates the expression and accumulation of numerous proteins to minimize the effect of potential stressing factors, such as host plant extracts. Some of them are related with stress response, e.g. the heat-shock proteins (HSPs) which often show protective and stimulating biological functions. Therefore, here we tried to understand the role of HSPs in response to stress conditions exerted by the presence of plant metabolites from host species. The main objective of present study was to examine the changes in the expression of two *Hsp* genes after the addition of aqueous extracts from four potential host species in *Fusarium proliferatum*.

Asparagus-derived *F. proliferatum* strains was cultured *in vitro* using a liquid medium, which at the 5th day of cultivation was supplemented with plant extracts made from asparagus, maize, garlic and pineapple tissues. Mycelia were collected every two days from liquid cultures before and after extract added and subjected to the total mRNA extraction. To validate the expression profiles of *Hsp70* and *Hsp88* genes, specific primers were designed based on previously obtained partial genomic sequences and quantitative RT-PCR technique was used and normalized against the constitutively expressed *tub2* gene.

The expression levels of *Hsp70* and *Hsp88* genes varied relating to host extract used. The *Hsp88* gene was expressed in all samples whereas the expression of the *Hsp70* gene was observed 24 h after the extract supplementation. The asparagus extract induced the highest increase of *Hsp70* and *Hsp88* transcript levels and garlic extract was the second most effective inducer. In the *Hsp88* expression profile we observed two expression peaks: after 24 h of extract supplementation and after 12 days of cultivation (7 days after extract application). We have demonstrated that dissimilar nutritive environments have significant impact on stress-related gene expression profiles in *F. proliferatum*.

This research was supported by the Polish National Science Centre Project 2015/17/B/NZ9/03577.

PP-84 Cadmium and Deoxynivalenol in durum wheat grains: physiological and biological basis of the co-contamination.

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Cadmium (Cd) and mycotoxins are among the most worrying contaminants that threaten the safety of food products derived from cereal kernels. Indeed, as recently supported by the last French total diet survey (Anses, 2011), deoxynivalenol (DON) and Cd human exposure through food mainly results from the consumption of cereal-derived products. Durum wheat is the most sensitive cereal culture for both DON and Cd accumulation in kernels, leading to a high frequency of co-contaminated harvests. This frequent co-occurrence (even though each toxic substance is in concentration within the EU regulatory limits) combined with the fact that Cd and DON are likely to be distributed in the same milling fractions raises the concern of consumer exposure to the cocktail Cd+DON.

To address the issue of DON+Cd co-contamination, the CaDON initiative (funded by the French National Agency for Research, 2015-2019) investigates the relations between Cd and DON occurrence in durum wheat, from crops co-contamination in the field to the milling end products, as well as the toxicity of Cd and DON mixtures upon ingestion. One of the objectives pursued by the CaDON project aims to elucidate the physiological bases of Cd+DON contamination of durum wheat kernels. The effect of soil Cd contamination on *Fusarium graminearum* infection and DON accumulation in kernels and conversely of *F. graminearum* infection on Cd accumulation are investigated through the implementation of *in vitro* and greenhouse experiments. As a first step, the way *F. graminearum* exposition to Cd affects the production of DON is analysed and the mechanisms underlying this modulation investigated with a strong focus on the relation between Cd/oxidative stress/DON biosynthesis. These insights will be the subject of the present communication together with the first data delivered by greenhouse experiments.

Anses, 2011. <https://www.anses.fr/fr/content/les-etudes-de-l'alimentation-totale-eat>