ABSTRACTS OF LECTURES AND POSTERS

THE World Mycotoxin Forum®

13TH CONFERENCE

WMF meets Italy

16-18 MAY 2022

PARMA - ITALY

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on the fungus considered, more effective and promising results were obtained on mycotoxins with reduction higher than 70% for aflatoxins, fumonisins and trichothecenes. A different efficacy was obtained by each natural extract in relation with the target fungus-mycotoxin considered. **Acknowledgements**. Funding, Initiative under the 2014-2020 Emilia-Romagna Rural Development Programme – Operation Type 16.1.01 – Operational Groups of the European Innovation Partnership 'Agricultural Productivity and Sustainability' – Focus Area 3A – Innovation Plan 'MIlk_COntrollo'.

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DEOXYNIVALENOL AND PIGMENTED GRAINS: FROM ORGANISMS TO CELLS

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The study of plant-mycotoxin interaction is commonly carried out by collecting naturally contaminated samples from cultivated fields. To evaluate the physiological response of plants to mycotoxins, *in vitro* systems, such as plantlets, organs, or cells cultures, are often preferred to fields trials and greenhouse experiments, despite their obvious distance from natural conditions. *In vitro* techniques, besides being a consolidated approach to investigate the metabolic fate of mycotoxins, allow to speed up the analysis due to a germplasm collection, which ensures working regardless of the seasons. To aid data interpretation regarding deoxynivalenol (DON) biotransformation, we propose a metabolic comparison between plantlets (differentiated tissue) and cells (undifferentiated), i.e., a metabolic study at the cellular level taking advantage of suspensions of undifferentiated cells of wheat (*Triticum aestivum*) varieties. The cultures were grown in appropriated medium and, during the exponential phase, 100 µg DON was inoculated directly into the suspension. Periodically, the medium was sampled for an indirect test concerning toxin adsorption. At the end of the experiment (10 days), cells were collected and analysed. At the same time, similar experiments were conducted using whole plants with the same varieties in aseptic culture. DON solution (100 µg) was dissolved in the liquid medium in plantlets-containing jars. As described above, at various times, medium was collected and at the end of experiment roots and leaves were separated and frozen. All samples (medium, cells, roots, and leaves) were subsequently subjected to LC-MS/MS analysis. Particular attention, in both tests, was put on the absorption trend of DON, much faster for cells than in whole plants. Regarding the plantlets results, roots contained a high amount of untransformed DON, while leaves are able to effectively biotransform DON to DON-3-Glc. Deoxynivalenol and its gluco-conjugated derivatives were also found in the wheat suspension culture, indicating the capability of undifferentiated cell to biotransform DON as in differentiated tissue. None of these biotransformation metabolites were detected in the culture media at the end of the tests, indicating an evident cell retention. Different DON to DON-3-Glc ratios were found depending on the wheat varieties, suggesting different susceptibility/resistance towards the accumulation of DON present in undifferentiated cells of the varieties used. These preliminary data may suggest the use of undifferentiated cells as a faster but reliable model to investigate wheat response to DON accumulation.

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BIOFORMULATE TO REDUCE THE ACCUMULATION OF AFLATOXINS IN MAIZE BASED ON A BIOPOLYMER AS A CARRIER AND SUPPORT FOR GROWTH OF THE BIOCONTROL AGENT

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Maize (*Zea mays* L.) is the cereal with the highest volume of production worldwide, and the second most important in Argentina. The presence of aflatoxins in the different stages of the maize agri-food chain is a current problem in food safety and it is caused by the contamination with species of *Aspergillus* section *Flavi*, mainly *A. flavus*. During many years the research group has focused on the development of a biological control strategy based on the competitive exclusion mechanism. Several studies have demonstrated the effectiveness of the non-toxicogenic *A. flavus* AFCHG2 strain developed by solid state fermentation on long grain rice. However, considering the United Nations Sustainable Development Goal of zero hunger, it was proposed to replace this substrate and to develop a biopolymer that allows the growth and transport of the biological control agent to be applied to crops. such as maize and peanuts. In this sense, different natural, economic, and starch-rich substrates were analysed: cassava starch (10 and 15%), rice flour (10 and 15%), and maize starch (5, 10 and 15%). In addition, urea was added as a nitrogen source and citric acid as promoter of greater crosslinking of starch chains. Also, the

development of the biocontrol strain in polymers with the addition of glucose or sucrose was evaluated. The diameter of the pores of each polymer was determined and those with a pore diameter of 93-97 µm were selected assuming they allow a better use of the entire substrate by the biological control agent. In addition, the growth of the biological control strain in the different preparations was analysed. The synthesis of this biopolymer included stages of gelation, cooling, freezing, thawing, drying, sterilization and curing, hydration, pH regulation, inoculation, incubation, and final drying. The effectiveness of the bioformulate evaluated under field showed a reduction of 81% in aflatoxin accumulation in maize kernels in comparison with the non-inoculated controls. The development of this biotechnological tool allowed us to present a process and product patent that is currently pending. In addition, it offers to producers an eco-friendly, economical, and safe alternative that contributes to food quality and safety.

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INFLUENCE OF TEMPERATURE AND WATER ACTIVITY ON GROWTH AND AFLATOXIN PRODUCTION OF *ASPERGILLUS FLAVUS* STRAINS ISOLATED FROM CHICKPEAS

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Chickpea (*Cicer arietinum* L.) is one of the most cultivated pulses in terms of world production. There is a high demand for world production due to the crop's nutritional value. In Argentina, most of chickpea production is exported. Chickpea is susceptible to more than 25 well-documented fungal pathogens that cause seed deterioration and contamination with mycotoxins. The most worldwide prevalent fungi in chickpeas are species belonging to *Aspergillus*, *Fusarium*, *Penicillium*, *Alternaria*, and *Rhizopus* genera. In a previous study, we observed that *A. flavus* was the prevalent fungi isolated from chickpea. Considering that *A. flavus* has the ability to produce aflatoxins (compounds classified in group 1 by IARC) and aflatoxin production and fungal growth of *A. flavus* can be influenced by abiotic conditions, the effect of water activity (a_w, 0.99, 0.98, 0.96, 0.94, 0.92, 0.90 and 0.87), temperature (15, 25, and 30°C), incubation time (5, 10, 14, and 21 days), and their interactions on mycelial growth and aflatoxin production in a chickpea-based medium by three *A. flavus* strains isolated from chickpea in Argentina was evaluated. Maximum growth rates were obtained at a_w 0.99 and 30°C, with growth decreasing as the a_w of the medium was reduced. Maximum amounts of aflatoxins were produced at 0.99 a_w and 25°C after 5 days of incubation for 2 strains, and at 25°C and 0.96 a_w after 21 days of incubation for the third strain. Aflatoxin concentrations varied depending on the aw and temperature interactions assayed. Two-dimensional profiles of aw by temperature interactions were developed from these data to identify areas where conditions indicate a significant risk from aflatoxin accumulation on chickpea. This study provides useful data about conditions representing a high and a low risk for aflatoxin contamination of chickpea which is of greater concern because chickpea is destined mainly for human consumption.

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FROM THE TREASURE CHEST OF PLANT BIOACTIVES TO THE FUTURE OF NEW CROP PROTECTANTS FOR A SUSTAINABLE AGRICULTURE: THE POSSIBLE EXPLOITATION OF *CITRULLUS COLOCYNTHIS* L. (SCHRAD.) EXTRACTS AGAINST *ASPERGILLUS FLAVUS* AND AFLATOXINS AND OTHER STORIES.

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The world of plant extracts and natural compounds have long been regarded as a promise land for the individuation of healthy alternatives to chemical preservatives, against microbial contamination, in food and feed commodities. A plethora of aromatic and medicinal plant species have been studied from decades to explore their antimicrobial and antioxidant properties, in order to both validate their ethnobotanical use for healing microbial illnesses and assess their suitability as food preservation agents. In fact, after terrestrialization and during the following evolutionary pathway, plants had to develop chemical compounds – constitutive and/or induced – for defense against specific pathogens, therefore becoming a potential source of new natural products usable with antimicrobial purposes. Aside from the most common contaminants that could occur in foodstuff, mycotoxigenic fungal species