

## **DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)**

Mycotoxins are secondary mould fungi metabolites hazardous for human/animal health. Such fungi are frequently found in cereal grain. There is some scientific evidence that presence of some mycotoxins (for example deoxynivalenol - DON, zearalenone – ZEN, and others) in a plant/animal organism triggers an enzymatic pathway of xenobiotics detoxification, which results in a formation of the reaction products of the first and second phases. As a result of these processes, the presence of mycotoxins with modified structure, which are more or less toxic in foods is possible (enzymatic modification). In recent years plenty of various forms of modified mycotoxins were revealed in food and feed (free conjugates of mycotoxins with other substances, bonded with biopolymers) which are not identified using standard techniques. Polish cereals are most often infected with the *Fusarium* family fungi, which produce mostly DON and ZEN. Their modified forms include among others 3- or 15-acetylo-DON (3- or 15-ADON), DON-3-glucoside (DON-3Glc), deoxynivalenol -3-sulfate (DON-3S), deoxynivalenol-15-sulfate (DON-15S),  $\alpha$ - or  $\beta$ - zearalenol (ZOL), ZEN-14- or 16-glucoside (ZEN-14- or 16-Glc), ZEN-14-sulphate (ZEN-14S). On some of these compounds we only know that they exist.

Research proposed in this project covers the study of the pathway of detoxification of DON in different genotypes of common wheat plants and the study of these pathways in the presence of fusarium ear promoter (*Fusarium*). The research will be carried out in the blossoming stage of grain, at specified intervals after DON injection to ear. In a further stage of the research similar experiment will be done but the promoter of DON in the body plant will be pathogen (*Fusarium culmorum*), formed after inoculation of wheat plants under controlled conditions (greenhouse / tunnel). Finally, a similar experiment will be made after inoculation of *Triticum aestivum* L. in environmental conditions. In the final stage of the study wheat flour contaminated by DON, ZEN and their masked derivatives will be used to bake bread using direct yeast method and sourdough. After the process of baking bread, the degree of degradation of the tested substances will be examined. Thus it will be possible to compare the stability of basic mycotoxins with their modified forms.

The topic of modified mycotoxins is quite important from the toxicological point of view since very little is known (or it is not clear) about their toxicity on human health. Interest in the present topic is also due to insufficient data on the occurrence of these compounds in foods, their stability under the influence of various environmental factors, very limited knowledge about the genesis of these substances involving enzyme system of microorganisms, plants and animals. The need for law regulation of modified mycotoxins in respect of maximum content is recognized by the European legislative bodies as well founded, but because of the lack of toxicological data, the determination of these values is not possible until now. In view of a growing interest in conjugated and other forms of mycotoxins, European Food Safety Agency set up in 2014 the *Working Group on Masked Mycotoxins in Food and Feed*.

We think the proposed research is significant for development of agricultural sciences, since it may help to demonstrate the widespread presence of masked substances isolated in recent years *in vitro* (e.g. DON-3S, DON-15S) in cereal grains, and even the isolation and identification of new derivatives of mycotoxins, not described before in the literature (as the result of the detoxification of DON in wheat plants). It may also help to explain the mechanism of biosynthesis, and factors influencing biosynthesis of conjugated mycotoxins. Besides, through this research it will be possible to describe their stability during the process of baking bread, and especially a very important aspect in the wider aspects of food safety - the ability to degradation of masked derivatives of DON and ZEN to their basic forms under the influence of enzymes of yeast and bacteria present in the starter culture and fermentation phase of dough intended for baking bread.

Accordingly to the authors proposed project is very difficult and demanding, but inspiring, very interesting and important. The topic of this research has not been carried out by national research centers, but take the development of new topics of research conducted by some European academic institutions (University of Natural Resources and Life Sciences, Vienna, Austria; the University of Parma, Italy).