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EDITORIAL

Mycotoxin occurrence in Egyptian foods:- Highlights on the findings of the past decade

Muhammad Gado [1], Doha Abdelsadek [2], Fatma Zahran [3], Nada Nabil El-Salhey [4], Ohaila Mehrez [5], Sara Abdel-Hay [6], Sahar M. Mohamed [7], Mohamed F. Abdallah [8]*

[1] Faculty of Pharmacy, Mansoura University, Egypt.
[2] Faculty of Pharmacy, Cairo University, Egypt.
[3] Faculty of Pharmacy, Menoufia University, Egypt.
[4] Faculty of Pharmacy, Kafrelsheikh University, Egypt.
[5] Faculty of Pharmacy, Ain Shams University, Egypt.
[6] Faculty of Pharmacy, Tanta University, Egypt.
[7] Chemistry Department, Faculty of Science, Sohag University, Egypt
[8] Department of Veterianry Toxicology and Forensic Medicine, Assiut University, Egypt.
*Corresponding author: mohamed.fathi@vet.au.edu.eg (M.F.A).

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Mycotoxins are classified as a group of several secondary metabolites produced by numerous fungal species (*Aspergillus, Penicillium, and Fusarium*). Most of these metabolites pose considerable toxic effects on human health and some of them are carcinogenic such as aflatoxins (AFs) or cancer promoters such as fumonisins (FBs) (Abdallah et al. 2017). Over the last decennary, a lot of publications have investigated the natural occurrence of mycotoxins in various food matrices from Egypt. The surveyed food samples covered several cereals, cereal-based products, dairy products, fish, meat, spices and others. Sampling locations were diverse, however, The Greater Cairo Area, the largest metropolitan area in Egypt, was the most frequently surveyed region followed by the upper part of the country.

Raw milk and dairy products appeared to have an alarming occurrence pattern and unacceptable concentrations of aflatoxin M_1 (AFM_1), mostly exceeding the limits permitted by the Egyptian and European regulations of 0 µg/L and 0.05 µg/L, respectively (Shaker and Elsharkawy 2014; Magdy and El-Fatah 2015; Abdallah et al. 2019; Zakaria et al. 2019; Ahmed et al. 2020; Ismaiel et al. 2020). In addition, only one survey reported the presence of both aflatoxin B_1 (AFB_1) and ochratoxin A (OTA) in several types of cheese and dairy prodcuts at concentrations that exceeded the European regulations of both mycotoxins in some foods, as both are not so far regulated in milk or dairy products (Ahmed et al. 2020).

Reports on maize and its products have revealed the natural occurrence of a wide array of mycotoxins including the global common ones such as AFB_1, M_1, fumonisin B_1 (FB_1), nivalenol (NIV), deoxynivalenol (DON), OTA, zearalenone (ZEN), T-2 and HT-2 toxins (Madbouly et al. 2012; El-Desouky and Naguib 2013; Nooh et al. 2014; Abdallah et al. 2017, 2019; Deabes 2018; Sebaei et al. 2020). In the study of Abdallah et al., the detected levels of multiple mycotoxins in maize samples collected from Upper Egypt, except AFB1, were not alarming (Abdallah et al. 2017). El-Desouky and Naguib concluded that ZEN levels in all of the surveyed maize samples (n=30) were within the permissible limits authorized by the European Union (El-Desouky and Naguib 2013). Overall, contamination with AFs, mainly AFB1, in the Egyptian maize was observed to be high, nevertheless, all the other aforementioned mycotoxins appear to occur in low concentrations, though continuous exposure to these low amounts can be hazardous.

AFs and FBs contamination in wheat and rice, was reported in varying amounts. A recent survey on wheat (n=36) has revealed the presence of AFB_1 and OTA in 33% and 5.6% of the samples, respectively (Hathout et al. 2020). The reported total AFs was more than 4 µg/kg in all the analyzed samples which exceeds the European regulations. In another report, total AFs in rice averaged 4.81 µg/kg and 30% of the samples contained FBs levels of more than 1000 µg/kg (Madbouly et al. 2012).

Conducted analyses on meat and its products revealed the occurrence of AFs and OTA at unsafe concentrations if compared to the established European maximum limits in other foods. In a recent report, AFB_1 was detected in six samples of basterma (n=40) at a mean of 21.8 µg/kg, and OTA in 4 sausage samples (n=40) at a mean of 10 µg/kg (Algammal et al. 2021). Abd-Elghany and Sallam also reported 100% contamination of OTA and AFs in beef burger (n=25) and luncheon (n=25) with maximum values of 8.5 and 7.5 µg/kg, respectively (Abd-Elghany and Sallam 2015). In addition, Zohri et al. reported the mycotoxin diacetoxyscirpenol in five beef burger samples, for the first time, in Egypt and a high concentration of ZEN of more than 100 µg/kg in only one sample of beef burger (Zohri et al. 2014).

A study on frozen imported beef liver (n=50) recorded AFB1 at levels below 1.1 µg/kg in 96% of the samples, which is below the European maximum limit set at 2 µg/kg, but may exceed the limit determined for infants and young children of 0.1 µg/kg (Kirrella et al. 2017). Another study on twenty chicken livers showed the contamination with neosolaniol, DON, NIV and HT-2 toxin in low amounts that averaged 4.3, 1.5, 13.2, 7.9 µg/kg, respectively (Mahmoud et al. 2018). In addition, an investigation on Nile tilapia fish (n=25) detected AFs in concentrations that ranged from 0.001 to 12.9 µg/kg (Mohamed et al. 2017). Data on spices showed the natural occurrence of AFs and OTA at maximum concentration of 8.2 and 6.7 µg/kg, respectively (El-Dawy et al. 2019). Evidence also showed the contamination of roasted peanuts with AFs. In Abdel-Rahman et al., 33% of the 36 samples were higher than the European Commission top limit for total aflatoxin of 4 µg/kg (Abdel-Rahman et al. 2019), whereas according to El-Shanshoury et al., all the contaminated samples exceeded the regulatory limits (El-Shanshoury 2014).

Lastly, the only available survey on dried date palm fruits reported a concerning level of ochratoxins with a median value of 58.7 µg/kg for OTA, and AFs at a level that exceed the European limit. Fumonisin B_2 and kojic acid contamination were also reported, for the first time, in this commodity (Abdallah et al. 2018). The present report has attempted to highlight the occurrence of mycotoxins in the Egyptian foods as they are representing a worldwide threat of food safety and therefore raising significant economic and health challenges. Periodical detection of mycotoxins is highly recommended. Doubtless to say that enhancing the public awareness is crucial for an effective control of mycotoxin exposure. Furthermore, the current Egyptian regulations should also include all other common toxins like FBs, DON and ZEN to prevent their potential health hazards.

Conflict of Interest

The authors declare no conflict of interest.

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