



河南工业大学

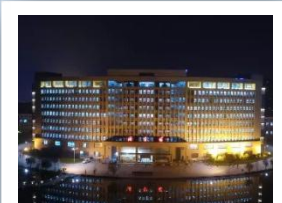
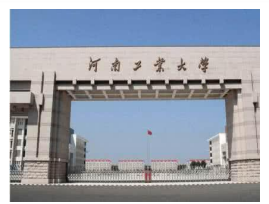
Henan University of Technology

# Pre-harvest and Post-harvest control of Aflatoxin in Maize

Henan University of Technology, Zhengzhou, Henan

Province, China

Prof. Yanli Xie





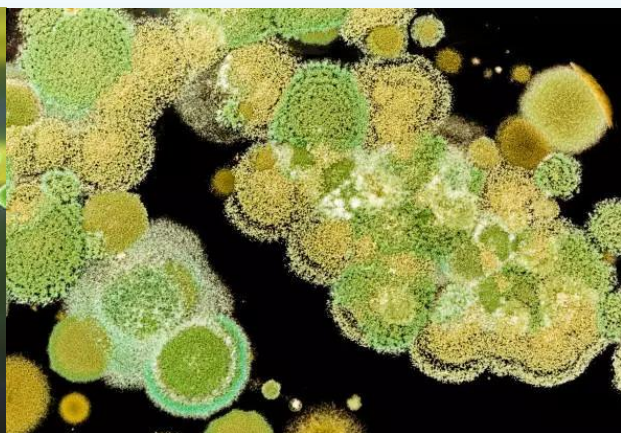
# CONTENTS

1. Introduction
2. Factors influencing Aflatoxin
3. Pre-harvest control of *aspergillus flavus*
4. *Post-harvest control of Aflatoxin B1*
5. Aflatoxin B1 limit standard in China
6. Detection methods of Aflatoxin B1

# 1. INTRODUCTION -AFLATOXINS



- Mycotoxins widely found in nature are toxic secondary metabolites produced by fungal species, which can cause grain and agricultural products to be contaminated.
- According to the Food and Agriculture Organization of the United Nations (FAO), almost 25% of the world's food supplies are contaminated by mycotoxins annually.





# Aflatoxins

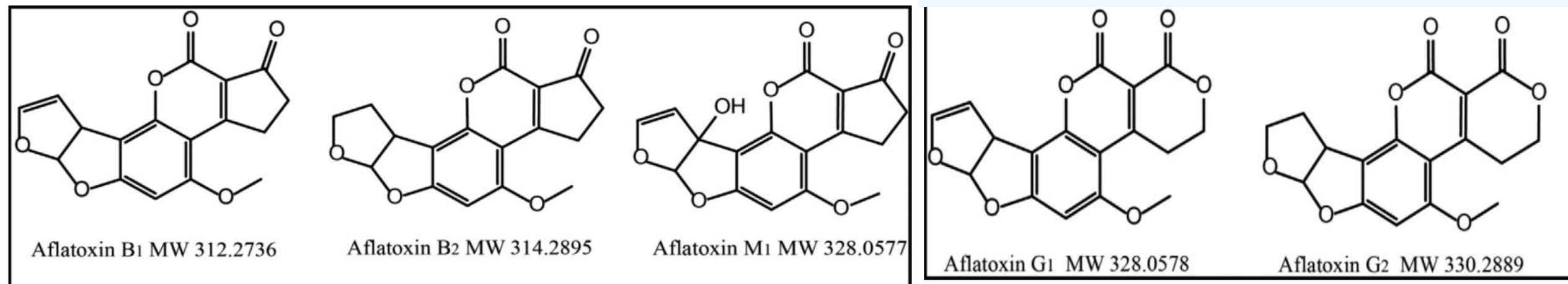


- Aflatoxins (AFs), which are a class of secondary metabolites produced by *Aspergillus* filamentous fungi such as *Aspergillus flavus* and *Aspergillus parasiticus* in the field and during the storage of agricultural products, are toxins leading to human carcinogenicity, teratogenicity and mutagenicity.
- Aflatoxins commonly contaminate staple commodities, such as cereals, maize, peanuts, nuts, rice, and many others, during poor storage and processing conditions.



# Aflatoxins (AFs)

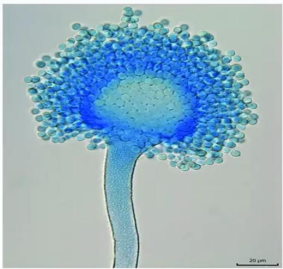
- Among the many analogs and derivatives of aflatoxins that have been identified, the B-series (AFB1 and B2), the G-series (AFG1 and G2), and M-series (AFM1 and AFM2) are of the most relevance from a food safety point of view.
- The four major aflatoxin metabolites are B1, B2, G1, and G2, of which aflatoxin B1 (AFB1) is considered to be the most potent naturally occurring liver carcinogen known. Aflatoxin M1 is a toxic metabolite of aflatoxins, which is found in milk in animals administered with feed containing aflatoxins. When we drink milk, it is very likely that we are exposed to this toxin metabolite.



# Aflatoxins (AFs)



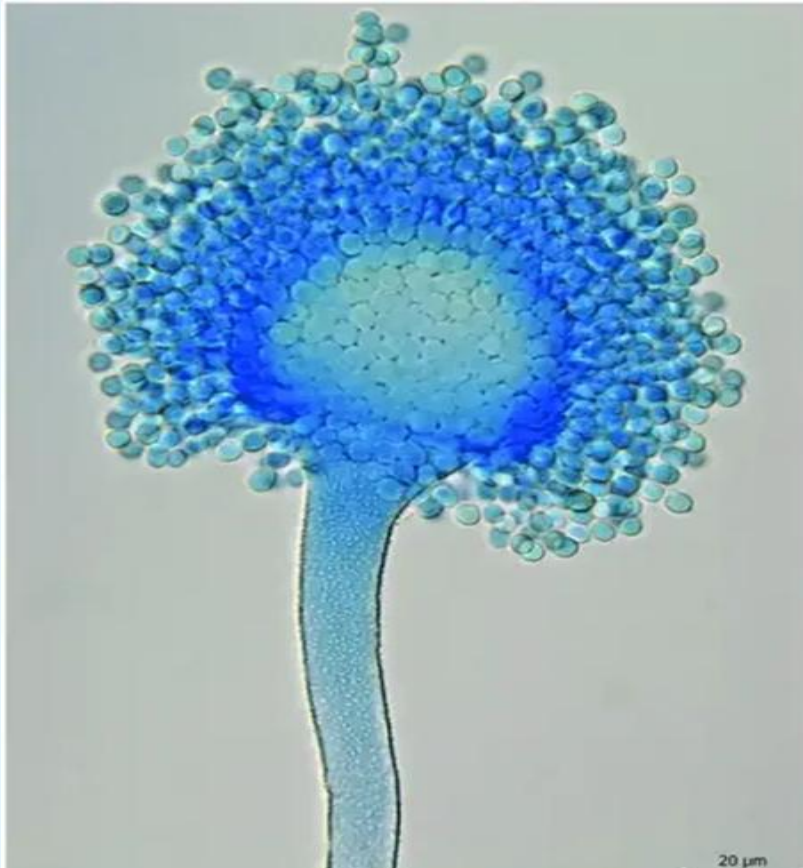
- Aflatoxin contamination of feed and foodstuffs is responsible for significant economic losses due to loss of crops and animals and in some years estimated losses ranged between \$85 and \$100 millions in certain states of the United States of America.
- Of approximately 400 mycotoxins identified up to now, aflatoxin B 1 (AFB 1 ) has received particular concern because of its role as a risk factor for liver cancer in humans.
- AFB 1 and its metabolites are mainly distributed in maize, peanuts, rice, wheat, oil by-products. It is estimated that over 5 billion people worldwide are at risk of chronic exposure to AFs in food.





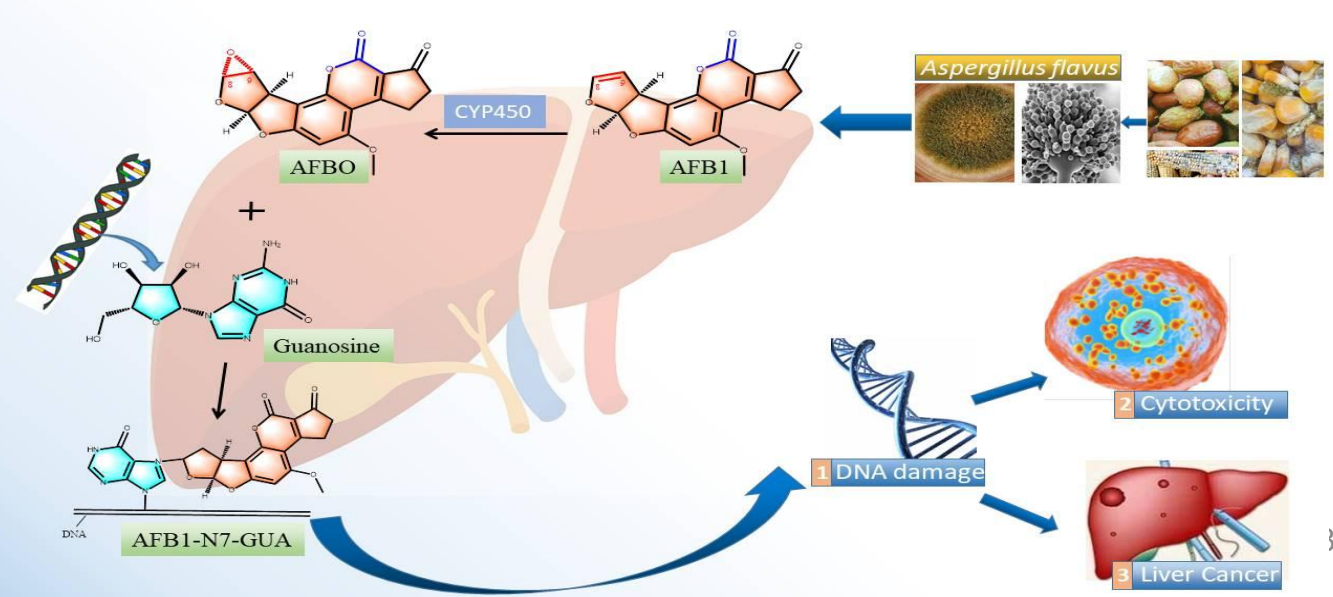
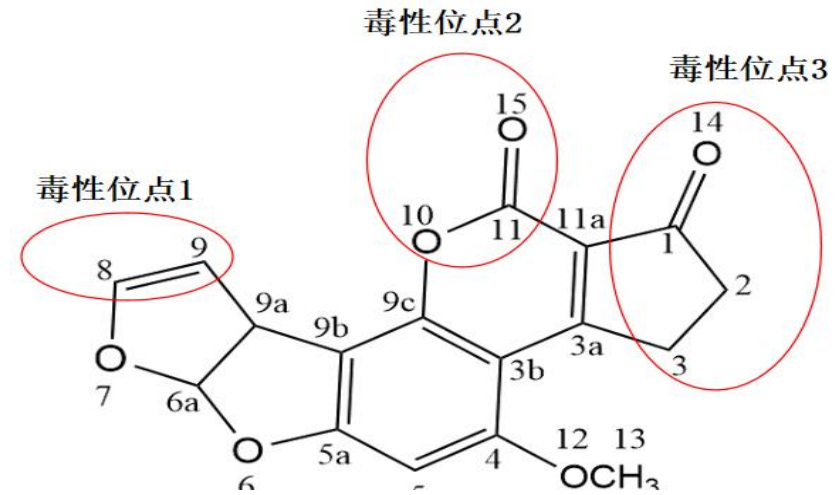
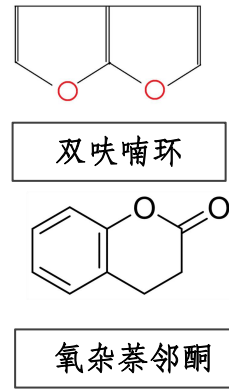
# The hazards of aflatoxin B1

- Aflatoxin B1 (AFB1) is a natural carcinogen produced mainly by *Aspergillus flavus* and *Aspergillus parasiticus*.
- *A. flavus* grows in food and feed stored in warm and humid conditions plus other influencing factors



# Cont...

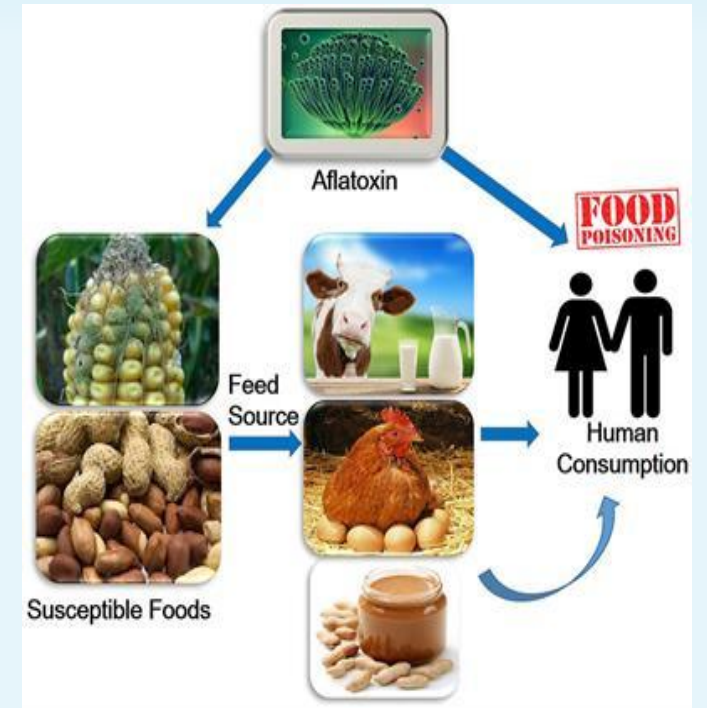
- The risk of human aflatoxicosis due to the consumption of aflatoxin-contaminated maize is high in tropical areas
- Because temperature and humidity levels support the growth of and infection by the fungus, as well as its aflatoxin production





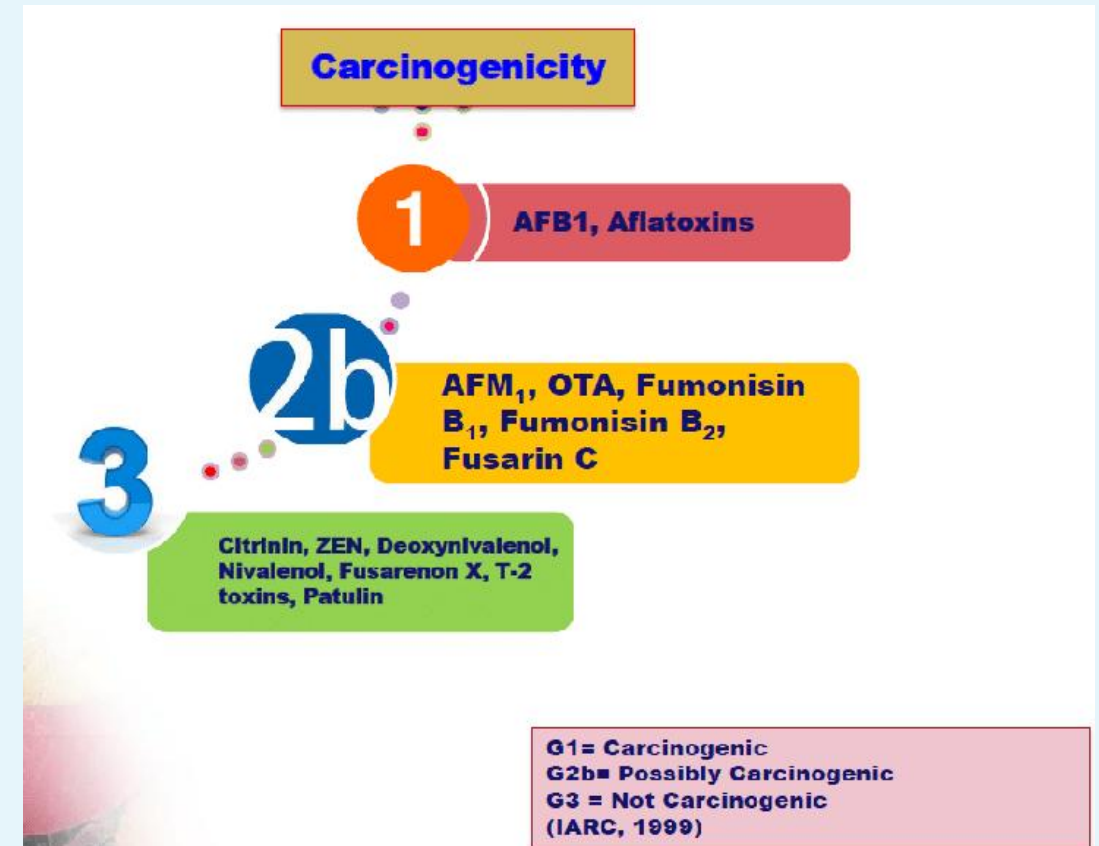
## Cont...

- AFB1 is the most toxic and widely known mycotoxin for its severe intoxication in the aflatoxin family
- Aflatoxins can also be acutely toxic or even fatal for both humans and livestock.
- AFB1 is the heat-stable compound that cannot be destroyed during most food processing conditions
- Aflatoxins, when inhaled, ingested, or adsorbed through the skin, even at very small concentrations have carcinogenic, hepatotoxic, teratogenic, and mutagenic effects in humans and animals



## Cont...

- The International Agency for Research on Cancer (IARC) classified AFB1 as a group I carcinogen, hence proven to be a human carcinogen
- It is well known for its involvement in:-
  - ✓ Malnutrition,
  - ✓ immune weakness,
  - ✓ hepatic carcinogenesis,
  - ✓ reproduction deficiency, and
  - ✓ growth impairment.



# AFB1 contamination on food and feed products and international trade

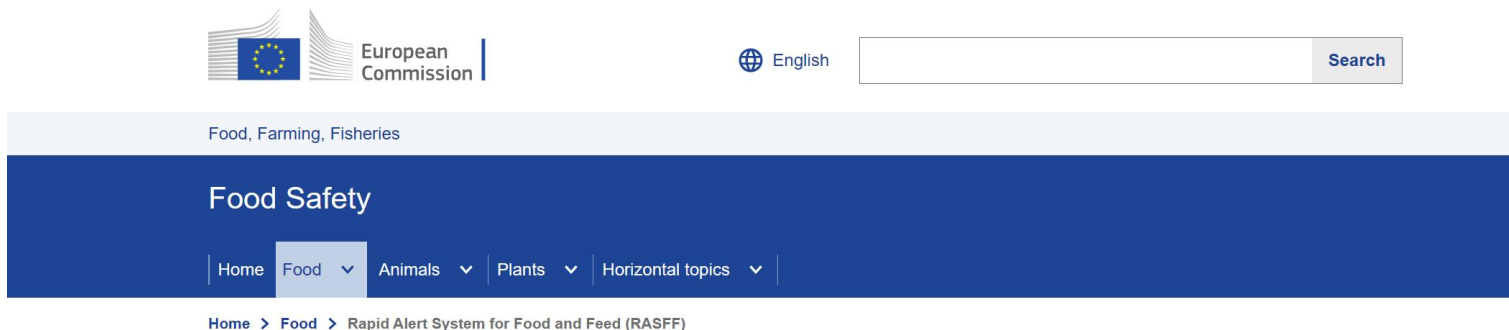
- From a food safety and international trade point of view, it is important to assess and control the levels of aflatoxins in human food and animal feed
- Because aflatoxins are the major reason for rejecting imports of various feed and food products in international trade.





## EU Rapid Warning System for food and feed Rapid Alert System of Food and Feed (RASFF)

- ❑ In order to ensure the "safety of the tongue" of the people, ensure the safety of imported food, all countries have established food early warning systems and food safety certification. Among the many food warning systems, the EU Rapid Warning System for food and feed Rapid Alert System of Food and Feed (RASFF) enjoy a high degree of credibility and visibility.
- ❑ The Rapid Warning System for Food and Feed (RASFF) analyzes, the trend of the development and change of contaminated food in the past ten years, especially mycotoxin contamination, it was found that mycotoxin pollution ranked first among all the harm types.



### Rapid Alert System for Food and Feed (RASFF)



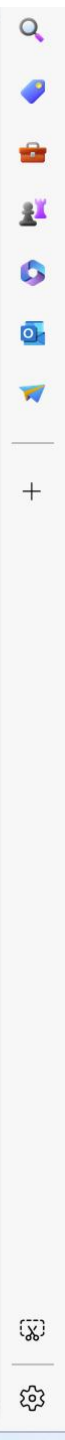


Show search criteria

# 1765 NOTIFICATIONS



Ref. ↓ ↑	Category ↓ ↑	Type ↓ ↑	Subject ↓ ↑	Date ↓ ↑	Origin	Notifying ↓ ↑	Class. ↓ ↑	Decision ↓ ↑	
2023.8671	Nuts, nut products and seeds	food	Aflatoxin in USA groundnuts	15 DEC 2023		Netherlands	border rejection notification	<b>serious</b>	<a href="#">Details &gt;&gt;</a>
2023.8631	Nuts, nut products and seeds	food	Presence of Aflatoxins in pistachios from United States and distributed to Italy	14 DEC 2023		Malta	border rejection notification	<b>serious</b>	<a href="#">Details &gt;&gt;</a>
2023.8627	Nuts, nut products and seeds	food	Ochratoxin A in pistachios from China via France	14 DEC 2023		Netherlands	alert notification	<b>serious</b>	<a href="#">Details &gt;&gt;</a>
2023.8621	Nuts, nut products and seeds	food	Aflatoxin B1 in Almonds from Australia via United Kingdom	14 DEC 2023		Netherlands	information notification for attention	<b>serious</b>	<a href="#">Details &gt;&gt;</a>
2023.8610	Nuts, nut products and seeds	food	Exceeding the MRL for aflatoxin B1 & sum of Aflatoxins B1, B2, G1, G2 in popcorn grain from Argentina/// przekroczenie NDP dla Aflatoksyny B1 i sumy Aflatoksyn B1, B2, G1, G2. w ziarnie kukurydzy POPCORN z Argentyny	14 DEC 2023		Poland	information notification for attention	<b>serious</b>	<a href="#">Details &gt;&gt;</a>
2023.8550	Nuts, nut products and seeds	food	Aflatoxins in pistachios from Iran, via Turkey	12 DEC 2023		Germany	border rejection notification	<b>serious</b>	<a href="#">Details &gt;&gt;</a>
2023.8515	Nuts, nut products and seeds	food	Mycotoxins in pistachios from the USA, via Germany	11 DEC 2023		Netherlands	alert notification	<b>serious</b>	<a href="#">Details &gt;&gt;</a>
2023.8514	Fruits and	food	Ochratoxin A in dried figs from Türkiye	11 DEC 2023		Italy	border rejection	<b>potentially</b>	<a href="#">Details &gt;&gt;</a>





# NOTIFICATION 2023.8610

Exceeding the MRL for aflatoxin B1 & sum of Aflatoxins B1, B2, G1, G2 in popcorn grain from Argentina/// przekroczenie NDP dla Aflatoksyny B1 i sumy Aflatoksyn B1, B2, G1, G2. w ziarnie kukurydzy POPCORN z Argentyny

notified 14 DEC 2023 by Poland | last update 14 DEC 2023 EC validated

<b>Reference</b>	2023.8610	
<b>Subject</b>	Exceeding the MRL for aflatoxin B1 & sum of Aflatoxins B1, B2, G1, G2 in popcorn grain from Argentina/// przekroczenie NDP dla Aflatoksyny B1 i sumy Aflatoksyn B1, B2, G1, G2. w ziarnie kukurydzy POPCORN z Argentyny	
<b>Notification type</b>	Food	
<b>Notification basis</b>	Official control on the market	
<b>Classification</b>	Information notification for attention	
<b>Risk decision</b>	Serious	

Copy to clipboard

## Risk

<b>Risk decision</b>	<b>Serious</b>	
<b>Hazards observed</b>	Aflatoksyna B1: 8,8 ± 1,0 Suma Aflatoksyn B1, B2, G1, G2: 9,4 ± 1,0	
<b>Nb. persons affected</b>	---	
<b>Symptoms / Illness</b>	Unknown	

## Organisations

Argentina (o)(op)    INFOSAN (ffa)    Poland (n)(op)

(n) Notifying | (o) Origin | (d) Distribution | (op) Operator  
(ffup) Flagged for Follow-Up | (ffa) Flagged For Attention

<b>Date of notification</b>	14-12-2023 09:41:31	
<b>Notifying country</b>	Poland	
<b>Product</b>	Popcorn // Ziarno kukurydzy popcorn	
<b>Product category</b>	Nuts, nut products and seeds	

## Measures taken

Country ↕	Action ↕	Product name ↕	URL
Poland	Informing authorities	Popcorn // Ziarno kukurydzy popcorn	None
Poland	Informing authorities	Popcorn // Ziarno kukurydzy popcorn	None