

# Study On Fungal Mycotoxigenic Contamination in Some Dried Fruits and Nuts

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## Abstract

Mycotoxin contamination is a financial issue for live stock and feed enterprises. In this examination normal event of three significant mycotoxins, for example, aflatoxin, ochratoxin and citrinin were inspected in five diverse dried fruits and nuts. 154 examples of dried fruits and nuts were gathered from better place. Characteristic occurrence of aflatoxins, ochratoxin A and citrinin in dried fruits and nuts examples were evaluated by Enzyme-connected immunosorbent measure (ELISA) strategy. Aflatoxins, ochratoxin An and citrinin were usually recognized mycotoxins from dry fruits were polluted with just aflatoxins. Most noteworthy measure of aflatoxins were identified from pistachio (442.8 ng/g) though the Fig. tests have least aflatoxin contamination (35.4 ng/g). The aftereffects of present examination propose that the almond, pistachio, cashew nut and raisins are helpless substrate for fungal development and further mycotoxin creation.

**Keywords:** *Mycotoxins, Dried fruit, Nuts, ELISA, PDA*

## 1. INTRODUCTION

Mycotoxins are auxiliary metabolites created by filamentous fungi that effectsly affect human and creature shoppers. They are basically different, getting from various biosynthetic pathways and their impact upon buyers is similarly assorted going from intensely toxic to immunosuppressive or cancer-causing. Until this point in time, seven mycotoxigenic *Aspergillus* species, four *Fusarium* species, and one *Penicillium* animal varieties have been disconnected from different horticultural yield items in the nation. There are five mycotoxin gatherings (aflatoxin, fumonisin, ochratoxin, nivalenol, and zearalenone) that have been identified in both the crude structure and the side-effects of significant harvests filled in the nation. Instances of mycotoxins causing human and creature disease incorporate aflatoxin, citrinin, fumonisins, ochratoxin A, patulin, trichothecenes, zearalenone, and ergot alkaloids, for example, ergotamine.

## 2. LITERATURE REVIEW

Giancarlo Perrone et. al. (2020) Toxigenic fungi and mycotoxins are extremely regular in food crops, with recognizable contrasts in their host explicitness regarding pathogenicity and poison contamination. We have hence inspected the accessible data from the most recent decade on relative dangers of mycotoxin contamination under future environmental change situations and recognized the holes in information. This has remembered the accessible logical data for the environment, genomics, dissemination of toxigenic fungi and mediation procedures for mycotoxin control around the world. Also, a few proposals for expectation and avoidance of mycotoxin chances are summed up along with future points of view and examination needs for a superior comprehension of the effects of environmental change situations.

Victor Kagot, Sheila Okoth, Marthe De Boevre, and Sarah De Saeger (2019) Fungal contamination and the ensuing mycotoxin creation is a deterrent to food and feed security, worldwide exchange and human and creature wellbeing. Other biocontrol ways to deal with relieve aflatoxins incorporate the utilization of lactic corrosive microscopic organisms and yeast species which have exhibited the capacity to forestall the development of *Aspergillus flavus* and resulting poison creation under research center conditions. In any case, these systems appear to be to be insufficient under field conditions. Biocontrol should be utilized related to great rural practices combined with great postharvest the executives to altogether diminish mycotoxins in the African landmass.

Saurabh Kumar Chhonker et.al. (2018) Contamination of food and feed by mycotoxins has become difficult issue around the world. Contamination of human food with mycotoxin at various phases of natural way of life has additionally been noticed. *Aspergillus*, *Alternaria*, *Claviceps*, *Fusarium*, *Penicillium* and *Stachybotrys* comprise the absolute most significant genera of mycotoxins. Alongside *Aspergillus* different mycotoxins are nephrotoxic, nephrocarcinogenic and furthermore influence the conceptive framework. Contextual analyses from the most recent multi decade propose that individuals living and working in soggy and rotten territory has more prominent odds of creating asthma, bronchitis, skin illnesses and other wellbeing problem.

Fuzia Elfituri Muftah Eltariki, Kartikeya Tiwari, Indang Ariati Ariffin and Mohammed Abdelfatah Alhoot (2018) Mycotoxins are an assortment of basic optional metabolites for the safeguard, that delivered by various sorts of fungi. This examination which got from past investigates seen that Aflatoxin was the most poison delivered by most fungi. *Aspergillus* was the most hereditarily adjusted fungus, conveying the most qualities answerable for delivering the fungal poisons.

Ukwuru MU, Ohaegbu CG and Muritala A (2017) Mycotoxins contamination of nourishments and feeds stay an incredible test to sanitation and of general wellbeing and monetary noteworthiness. A few investigations led to uncover the digestion of mycotoxins in the body are explored. Various systems for forestalling mycotoxins have been proposed however the mindfulness for execution is low. The utilization of media to make mindfulness is a reasonable choice.

### **3. MATERIAL AND METHODS**

#### **Sampling**

A sum of 154 dried fruits and nut samples (32 every one of almond and pistachio and 30 samples of every cashew nut, raisins and figs) were gathered from neighborhood market of various areas. Each sample was placed into the sterile cellophane sack and afterward put into the clean earthy colored envelope and put away at 4<sup>0</sup> C to arrest any mycotoxin formation before analysis.

#### **Isolation and identification of fungi**

All the samples of dried fruits and nuts were arbitrarily plated on the newly arranged Potato dextrose agar (PDA) and Standard blotting surface paper and brooded at 28 ± 20 C for 7 days and inspected every day. Fungal state tally was recorded following 5 to 7 days. Distinguishing proof was done by morphological attributes and followed and the ordered plans of Maren for variety *Aspergillus*, Pitt for *Penicillium*, Nelson for *Fusarium* and Funder for other genera.

#### **Potentiality of mycotoxin producing isolated fungi**

Mycotoxin delivering possibility of *A. flavus*, *A. ochraceus*, *A. paraciticus*, *P. citrinum*, and *P. verrucosum* were inspected. The subjective and quantitative assessment of mycotoxins creating possibility of fungi were finished by the strategy for Diener for aflatoxins delivering probability of *Aspergillus* spp.; Schwenk and Davis for testing ochratoxin An and citrinin delivering possibility of *A. ochraceus*, *P. citrinum* and *P. verrucosum*.

#### **Detection of natural contamination of mycotoxins by ELISA**

The subjective and quantitative discovery for regular event of mycotoxins in dried fruits and nuts samples were investigated by protein connected immunosorbent examine (ELISA). Aflatoxins were identified in the sample by utilizing Total Aflatoxin (AF) test unit (TO-E0006) and Ochratoxin An examine pack (To-E0001) was utilized for discovery of ochratoxin An and RIDASCREEN FAST citrinin Assay (R6302) for Citrinin location by the strategies for Turner.

### **4. RESULT AND DISCUSSION**

#### **Percent incidence of toxigenic fungi**

In our current examination, various of fungi were secluded in which some of them are notable for their mycotoxin creation. A sum of 5 fungal genera have a place with 15 animal groups were disconnected (Table 1). Fungi were identified based on their way of life and morphological attributes, these were distinguished as *Aspergillus parasiticus*, *A. niger*, *A. flavus*, *A. ochraceus*, *A. versicolor*, *A. fumigatus*, *A. terreus*, *Penicillium citrinum*, *P. islandicum*, *P. verrucosum*, *Fusarium oxysporum*, *F. moliniforme*, *Rhizopus nigricans* R. *Oryzae* and *Mucor hiemalis*. *Aspergillus* was the most prevailing genera followed by *Penicillium* and *Fusarium*. Algalibi was likewise separated *A. flavus*, *A. niger*, *A. terreus*, *A. ochraceus* from raisins and figs samples of Yemen. Zohri revealed relationship of *A. fumigatus*, *A. flavus* and *A. versicolor* in figs and raisins samples of Egypt and furthermore identified the degree of ochratoxin A was up to 120mg/kg in Fig. samples.

**Table 1: Percent incidence of isolated fungi from dried fruits and nuts**

Name of Fungi	Dry fruit & nuts				
	Almond	Pistachio	Cashew nut	Raisin	Fig
<i>Aspergillus parasiticus</i>	5.4	5.1	3.4	4.5	1.2
<i>Aspergillus niger</i>	2.1	4.2	1.2	3.2	0
<i>Aspergillus flavus</i>	15.6	24.8	13.4	12.4	4.8
<i>Aspergillus ochraceus</i>	14.2	12.1	11.6	15.5	6.5
<i>Aspergillus versicolour</i>	1.4	3.8	4.2	2.7	0
<i>Aspergillus fumigatus</i>	0	0	1.1	2.6	0
<i>Aspergillus terreus</i>	1.2	0	2.1	0	0
<i>Penicillium citrinum</i>	3.6	2.1	2.4	1.3	1.2
<i>Penicillium islandicum</i>	0	0	1.2	0	0
<i>Penicillium verrucosum</i>	12.4	11.6	13.4	13.8	0
<i>Fusarium</i>	2.8	1.2	5.1	1.2	0

<i>oxysporum</i>					
<i>Fusarium moniliforme</i>	3.1	0	1.2	0	1.8
<i>Rhizopus nigricans</i>	2.8	1.1	0	0	1.4
<i>Rhizopus oryzae</i>	0	2.5	1.8	0	0
<i>Mucor hiemalis</i>	2.1	1.1	3.1	2.1	1.2

### Mycotoxin producing potentiality of isolated fungi

Aflatoxins, ochratoxin A and citrinin delivering probability of *Aspergillus flavus*, *A. parasiticus*, *A. ochraceus*, *Penicillium citrinum* and *P. verrucosum* were introduced in Table 2. 44% of *A. flavus* was discovered to be toxigenic and created aflatoxins which range between 15.7µg/l – 22.8 µg/l whereas *A. parasiticus* likewise created aflatoxins however the degree of possibility was not exactly *A. flavus*. *A. ochraceus* and *P. verrucosum* created ochratoxin A with probability upto 16.5 µg/l and 18.7µg/l respectively. In present discovering ochratoxin A was created by *P. verrucosum* and *A. ochraceus* both. Niessen completed the sub-atomic analytic of comparative fungi for ochratoxin A creation.

**Table 2: Mycotoxins producing potentiality of fungi isolated from dried fruit and nuts**

Fungi examined	Positive/N.I.A <sup>1</sup>	% toxicity	Mycotoxin detected	Potential range (µg/l)
<i>Aspergillus flavus</i>	11/25	44.0	Aflatoxins	15.7 – 22.8
<i>Aspergillus ochraceus</i>	9/25	36.0	Ochratoxin A	6.5 – 16.5
<i>Aspergillus parasiticus</i>	5/18	27.7	Aflatoxins	5.4 – 9.2
<i>Penicillium citrinum</i>	7/18	38.8	Citrinin	3.5 – 9.3
<i>Penicillium verrucosum</i>	3/10	30.0	Ochratoxin A	8.4 – 18.7

<sup>1</sup> Number of isolates analyzed

### Natural occurrence of mycotoxins in dried fruits and nuts

In present examination, aflatoxins, ochratoxin A and citrinin were distinguished in the samples of dried fruits and nuts gathered from various places. The aftereffects of characteristic rate of afltoxins, ochratoxins An and citrinin in 5 unique sorts of dried fruits and nuts has been appeared in Table 3. 68.7% of pistachio samples were tainted with aflatoxins followed by 59.3% of almond and 52.5% raisin samples and figs samples had just 12.5% contamination. Most noteworthy measure of aflatoxins was recorded in pistachio samples (442.8 ng/g) where as in almond and raisins samples, it was 245.8 ng/g and 184.1 ng/g separately. The most minimal measure of aflatoxin was available in figs samples. Creator have likewise detailed aflatoxins contamination in dried fruits of Pakistan. The sum identified was goes from 3.28 µg/kg to 7.89 µg/kg. They noticed most reduced measure of aflatoxins in dried figs (3.28 µg/kg) and most elevated in Pistachios without shell (7.89 µg/kg). In this investigation, Ochratoxin An and citrinin was likewise identified from a wide range of dried fruits and nuts with the exception of figs. The most noteworthy measure of Ochratoxin A was distinguished in raisin samples (215.1 ng/g) and least in almonds (154.2 ng/g). Citrinin contamination was greatest in almonds (184.1 ng/g) and least in cashew nut (98.8 ng/g). Each of the 5 sorts of dried fruits and nuts were tainted with aflatoxins though ochratoxin An and citrinin was not distinguished from Fig. samples.

**Table 3: Natural occurrence of amount of mycotoxins contamination in dried fruits and nuts**

Sample s	Number of sample analyzed	% Contaminati on	Amount (ng/g) Mean ± S.E		
			Aflatoxi ns	Ochratoxi n A	Citrini n
Almond	32	59.3	245.8 ± 34.2	154.2 ± 18.8	184.1 ± 28.5
Pistachi o	32	68.7	442.8 ± 35.1	193.8 ± 35.7	158.0 ± 45.7
Cashew nut	30	43.3	214.5 ± 37.2	179.5 ± 28.5	98.8 ± 47.3
Raisin	30	52.5	184.1 ± 20.2	215.1 ± 30.2	174.1 ± 28.5
Fig.	30	12.5	35.4 ± 24.8	ND	ND

## 5. CONCLUSION

Based on the current investigation, it could be presumed that the dried fruits and nuts are rich substrate for fungal development and further mycotoxin creations. Each of the 5 sorts of dried fruits and nuts are defiled with aflatoxins and the identification level was incredibly higher than the reasonable furthest reaches of EU. Ochratoxin An and citrinin was additionally recognized from pistachio, raisins, almond and cashew nut samples and the identified sum was adequately high to actuated toxicity. Fig. samples were impervious to ochratoxin An and citrinin creation and none of the samples of figs were discovered polluted with ochratoxin An and citrinin. The measure of aflatoxins identified from figs samples were not exactly other dried fruits and nuts samples. Dried fruits and nuts are utilized consistently for medical advantages however presence of aflatoxins, ochratoxin An and citrinin is dangerous for the wellbeing of people. It is imperative to mind in preparing, dealing with and transportation to decrease the contamination of these perilous mycotoxins in dried fruits and nuts.

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