Journal of Nutrition and Food Security
Shahid Sadoughi University of Medical Sciences
School of Public Health
Department of Nutrition
Nutrition & Food Security Research Center

eISSN: 2476-7425 pISSN: 2476-7417 JNFS 2020; 5(4): 293-295 Website: jnfs.ssu.ac.ir

Application of Raman Technique in the Detection of Aflatoxins

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ARTICLE INFO

EDITORIAL ARTICLE

Article history:
Received: 25 Feb 2020
Revised: 7 Jun 2020
Accepted: 31 May 2020

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Aflatoxin is one of the most important topics of research in food contamination (mohamadigol r *et al.*, 2015). Aflatoxin, a member of the Mycotoxin family, is a secondary metabolite of molds such as *Aspergillus Flavus* and *Aspergillus Parasiticus* (Herrman *et al.*, 2020). These fungi also pollute the crops during production and storage (Aristil, 2019). In the case of the products' contamination with spores in the desired temperature and humidity conditions, the hogs grow, fungus is produced, and poison is created (Dana *et al.*, 2019). One of the most deadly toxins is Aflatoxin (Smith and Dent, 2019), which is known as Mycotoxin due to its considerable abundance in the nature, toxicity, and carcinogenicity (Kachapulula *et al.*, 2017). Several types of Aflatoxin, i.e., G1, G2, B2, B1 were identified, among which B1 Aflatoxins (AFB1) are most important (Arrus *et al.*, 2005). AFB1 is the most toxic compound in this group. The highest concentration of AFB1 is observed in food and animal feed (Eaton and Groopman, 2013). The concentration range of AFB1 varies in different food products; for example, in pistachios. According to the European Union, the acceptable AFB1 is 12 ppb (Parts per billion), but this amount may vary in different countries from 2 to 20 ppb (Meneely *et al.*, 2018). Among the 400 known Mycotoxins, AFB1 is considered as the most dangerous one to human health due to its severe effects of toxicity, carcinogenicity, fetal defects, and mutagenesis (Haruna *et al.*, O'Riordan and Wilkinson, 2008).

Among the most commonly used to detect this toxin high-performance liquid chromatography (HPLC) and immunohistochemistry columns are widely used for detection of Aflatoxin and other agricultural products in research and commercial areas (Dragacci *et al.*, 2001).

This paper should be cited as: Shirdeli M, Marzban A, Yaghoubi F, Shirani M, Shahidi MS. ***Application of Raman Technique in the Detection of Aflatoxins.*** *Journal of Nutrition and Food Security (JNFS)*, 2020; 5(4): 293-295.

[Downloaded from jnfs.ssu.ac.ir on 2024-04-25]
[DOR: 20.1001.1.24767417.2020.5.4.8.9]
[DOI: 10.18502/jnfs.v5i4.4430]

The stages of isolation and extraction of Aflatoxin are complicated, are time consuming, and require a lot of experimental experience in HPLC (Sinha, 1999). However, spatial costing method introduced by Raman is one of the simplest and least expensive spectroscopy techniques that allows the molecular detection of materials and applications in a variety of research fields. Today, Raman's technique is widespread and has a variety of uses in basic sciences (Smith and Dent, 2019).

When an electromagnetic radiation passes through a transparent environment, the existing species will scatter part of the beam in all directions. In 1928, Raman discovered that the wavelength was related to a small fraction of radiation emitted by specific molecules different from the initial wavelength (i. e., non-elastic or inelastic scattering). The difference between these wavelengths depends on the molecular structure of the compounds. Raman spectroscopy is based on the analysis of these differences to determine the molecular structure of different compounds (Vandenabeele, 2013).

In recent years, extensive research has been carried out in various fields of medicine and pharmacy over the use of Raman spectroscopy, and over the Raman Signal Upgrade Technique in particular (Hwang and Chang, 2011). The main focus of this research is on early detection and diagnosis of cancer tissue, bacteria, fungi, and pharmaceutical chemicals.

Considering the advances made in the field of optical technology and nanotechnology, development of the remarkable Raman spectrometer increased the global demand for using rapid and accurate detection of food contamination.

Acknowledgments

The authors would like to appreciate Dr.Abdolrazagh Marzban who assistanced us in writing the present article.

Authors' contributions

Shirdeli M was involved in designing and supervising the study. Marzban A and Shirani M were involved in designing the study, data collecting. Yaghoubi F and Shahidi MS participated in writing the manuscript. All authors critically reviewed the manuscript and approved the final version submitted for publication.

Conflict of interest

The authors stated no conflict of interest.

References

Aristil J 2019. Aflatoxin contamination of baby food flour sold on Haitian markets. *International Journal of Biological and Chemical Sciences.* **13 (3)**: 1821-1825.

Arrus K, Blank G, Abramson D, Clear R & Holley R 2005. Aflatoxin production by Aspergillus flavus in Brazil nuts. *Journal of Stored Products Research.* **41 (5)**: 513-527.

Dana MA, et al. 2019. Effect of benomyl and diazinon on acquired azole resistance in Aspergillus flavus and expression of mdr1 and cyp51c genes. *Current Medical Mycology.* **5 (2)**: 27.

Dragacci S, Grosso F & Gilbert J 2001. Immunoaffinity column cleanup with liquid chromatography for determination of aflatoxin M1 in liquid milk: collaborative study. *Journal of AOAC International.* **84 (2)**: 437-443.

Eaton DL & Groopman JD 2013. The toxicology of aflatoxins: human health, veterinary, and agricultural significance. Elsevier.

Haruna M, et al. Incidence of Fungal Flora and Aflatoxin in Some Spices Sold in Central Market, Funtua, Nigeria.

Herrman T, Hoffmann V, Muiruri A & Mccormick C 2020. Aflatoxin Proficiency Testing and Control in Kenya. *Journal of Food Protection.* **83 (1)**: 142-146.

Hwang G-J & Chang H-F 2011. A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students. *Computers & Education.* **56 (4)**: 1023-1031.

Kachapulula P, Akello J, Bandyopadhyay R & Cotty P 2017. Aflatoxin contamination of groundnut and maize in Zambia: observed and potential concentrations. *Journal of Applied Microbiology.* **122 (6)**: 1471-1482.

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[DOR: 20.1001.1.24767417.2020.5.4.8.9]

[DOI: 10.18502/jnfs.v5i4.4430]

Meneely JP, Hajšlová J, Krska R & Elliott CT 2018. Assessing the combined toxicity of the natural toxins, aflatoxin B1, fumonisin B1 and microcystin-LR by high content analysis. *Food and Chemical Toxicology*. **121**: 527-540.

mohamadigol r, khoshtaghaza mh & kmalekfar r 2015 .Detection of pistachio aflatoxin using Raman spectroscopy and neural network. *Journal of Agricultural Machinery* **5(1)**: 1-9.

O'Riordan MJ & Wilkinson MG 2008. A survey of the incidence and level of aflatoxin contamination in a range of imported spice preparations on the Irish retail market. *Food Chemistry*. **107 (4)**: 1429-1435.

Sinha KK 1999. Testing methods for aflatoxins in foods. *Food and Nutrition Bulletin*. **20 (4)**: 458-464.

Smith E & Dent G 2019. Modern Raman spectroscopy: a practical approach. John Wiley & Sons.

Vandenabeele P 2013. Practical Raman spectroscopy: an introduction. John Wiley & Sons.

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[DOR: 20.1001.1.24767417.2020.5.4.8.9]

[DOI: 10.18502/jnfs.v5i4.4430]