Biosci. Biotech. Res. Comm. Special Issue No 1:195-198 (2017)

BBRC
Bioscience Biotechnology
Research Communications

Determination of total aflatoxin in rice consumption in Yasuj, Iran

Ali Mousavizadeh[1], Amir Peikar[2], Ahmad Hoseinian[3], Emambakhsh Ghaydie[4] and Azizollah Pourmahmoudi[5*]

[1]PhD in Epidemiology, Social Determinants of Health Research Center, Yasuj University of Medical Sciences Yasuj, Iran
[2]Laboratory Manager Of Food And Drug Institute Attached To Yasuj University Of Medical Science, Iran
[3]Expert Laboratory Of Food And Drug Institute Attached To Yasuj University Of Medical Science, Iran
[4]Experimental Expert of Food And Drug Institute Attached To Yasuj University Of Medical Science, Iran
[5]Ph.D – Nutrition, Determinants of Nutrition,School of Health, Yasuj University of Medical Sciences, Yasuj, Iran

ABSTRACT

Aflatoxins are the secondary metabolitesof *Aspergillus flavus* and *Aspergillus parasiticus* which are often produced by molds. The consumption of food contaminated with aflatoxin poison, which is associated with many humans and Aflatoxicosis, in some cases can lead to death.Nowadays, rice is the foodstuff for half of theworld'spopulation. Rice is exposed to fungal and aflatoxin contaminations like other cereal crops. This study aimed toinvestigate and compare the amount of aflatoxin and the level of toxin in rice samples in Yasuj. In this study, 45rice samples collected from Yasuj supermarketsand the amount of aflatoxin contamination were tested by Elisa. The results showed that total aflatoxincontamination in all samples was lower than the national standard in Iran. The average amount of total aflatoxin in types such as Gerdeh, Champa, Shamim and Fajr, is6.53- 6.14- 4.54and 6.12 ng /g, respectively. Comparing the results of this study and other studies, it can be concluded that rice examined in this study is more desirable.

KEY WORDS: TOTAL AFLATOXIN, RICE, ELISA

ARTICLE INFORMATION:

**Corresponding Author: pourmahmoudi@gmil.com*
Received 27th Dec, 2016
Accepted after revision 2nd March, 2017
BBRC Print ISSN: 0974-6455
Online ISSN: 2321-4007
Thomson Reuters ISI ESC and Crossref Indexed Journal
NAAS Journal Score 2017: 4.31 Cosmos IF : 4.006

Online Contents Available at: http//www.bbrc.in/

INTRODUCTION

Rice is one of the most important crops. Grain dark is the staple food for half of the world's population (Payan, 2011). Rice cultivation has existed in Iran since the Achaemenid (Khodabande, 2010). It is cultivated widely in certain areas of the world such as China, India, Japan, Uruguay and parts of South Africa (Payan, 2011). Many agricultural products from the cultivation to consumption are prone to contaminate with fungi. If the fungipollution-causing strains of toxin,it may produce mycotoxin in some stage of its growth as a secondary metabolite. (Reza, Tahereh, Alireza, & bahar, 2011) Liu *et al*, 2015).

Despite numerous studies during the first half of the last century, only in the 1960s, itwas found that metabolites of fungi are responsible for the illness and death of livestock. Currently, it is well established that toxic mold metabolites are responsible for many epidemics in human and animal population (Reza, Tahereh, Alireza, & bahar, 2011). Mycotoxins are a natural group of toxic compounds produced by several species of fungi. These compounds have different chemical structuresandlow molecular weight that are found in a large number of agricultural products and food. In general, many types of grains, oilseeds, nuts and dried fruit are prone to fungal pollution(Majid, *et al*., 2008). The most important mycotoxins involve aflatoxins, patulin, ochratoxin A and zearalenone (Abdel-Wahhab & Kholif, 2010).

Aflatoxins are mycotoxins produced by the Aspergillus species and some species of Penicillium and Aspergillus flavus (Fink-Grernmels, 1999). Different types of aflatoxin are: AFP1, AFG2, AFG1, AFM2, AFM1, AFB2, AFB1 and AFQ1 that aflatoxin B1, biologically is the most active type between theknown aflatoxins (Kazemi, Mohtadinia, Mahdavi, Akbari, & Salehpour, 2008). The most important factors in aflatoxin production include temperature, humidity, oxygen concentration, substrate, PH nutrients, microbial interactions, the presence or absence of inhibitors such as organic acids as well as mechanical damage (Amanlou, Rezaei Khkha, Ramazani, & Meyer, 2014, Liu *et al*, 2015).

Kohgiluyeh and Boyer-Ahmad is one of the provinces, which has water resources and favorable climatic conditions for rice cultivation (Nader, Kobra, & Mohammad Javad, 2008). Six common varieties of rice in this province are Champa, Gerdeh, Tropical Champa, Shamim, Lenjan and Tarom (Cassel, Campbell, Draper, & Epperson, Aflatoxins: Hazards in grain/aflatoxicosis and livestock, 2001), (Arafa, Bloomer, Wilson, Simpson, & Harms, 1981). Since the review of total aflatoxin has not been conducted in this province and according to the importance of total aflatoxin monitoring in rice, thisresearch evaluates the total aflatoxin in the rice produced in Kohgiluyeh and Boyer-Ahmad.

MATERIALS AND METHODS

In this study, the rice sample was randomly collected from Yasuj shops, accordingto the sampling method of crops.

TOTAL AFLATOXIN ANALYSIS BY ELISA

In recent years ELISA method is used for the determination of mycotoxins. The ELISA method as a general technique for the early diagnosis and detection of mycotoxins with advantages such as sensitivity, sample preparation and easy operation, safety, high accuracy and time saving can be noted. This chemical method used antigen-antibody technique. This method is sensitive, fast and relatively inexpensive(Institute of Standards and Industrial Research of Iran, 2001)-(Khosravi, 1998).Total Aflatoxin competitive immunoassay kit EuroProxima B.V of the Netherlands was used to determine how much of the toxin existed in their food. Extraction and test methods for mycotoxins in the samples were performed according to the manufacturer's instructions.

SAMPLE PREPARATION

10 g ofthe rice powder sample was homogenized with 50ml of acetonitril in room temperature for 30 minutes was completely shaken. The extract was filtered by No. 42 Whatman paper and then 50 ml of the filtrate was diluted with 150 ml of buffer solution.100 ml of diluted extract was used per sink in the test.The rest was homogenized for 10 min at roomtemperature and then the resultant deposit was centrifuged.An aliqout (100 µl) of the supernatant was diluted with600 µl of phosphate buffer at pH = 7.2. An aliquot of thissolution (50 µl) or standard solution (50 µl), 50 µl of theaflatoxin-peroxidase conjugate and 50 µl of the mouseantibody solution against alfatoxin were added to eachsink of the used plate. The determination was replicatedthree times. The samples were incubated for 30 min at room temperature in the darkness. The free and peroxidase-combined aflatoxins compete for the combining site with antibodies to mouse antibodies immobilized on theplate. Next, the plate was emptied and washed five times with phosphate buffer at pH = 7.2. Then, 50 µl of tetramethyl benzidineAnd 50 µl of urea peroxide were added and incubated again for 30 min in darkness. The reactionwas terminated by adding 100 µl of the stop reagent. Theabsorbance of the solution was measured at a wavelength of450 nm, using an ELISA reading apparatus. The content of aflatoxins was calculated using the previously preparedstandard curve.

Table 1. Analysis of total aflatoxin in the samples of rice in the city of Yasooj.

Mim	Max	SD	Average	number of samples	Samples
6.42	6.63	0.09	6.53	7	Gerdeh
5.24	6.42	0.21	6.14	17	Champa
0.06	6.48	2.02	4.54	11	Shamim
5.09	6.9	0.58	6.12	9	Fajr

RESULTS AND DISCUSSION

The results are shown in Table 1. The findings of this study show that of the 45 samples all samples had total aflatoxin contamination, but it was lower than the standard limit. The limit of the toxin in different countries varies from 30 µg / kg to50 µg food. For example, in Iran it is 30 µg / kg of food material (Food corporation of India, 2011)-(Jonathan, *et al.*, 2004).The maximum amount of aflatoxin 6.9 and the lowest amount of poison was 0.06 .The average amount of poison in the tested samples was measured 5.83 µg / kg. Average total aflatoxin concentration of toxin in the samples of rice Gerdeh, Champa, Shamim and Fajr, 6.53,6.14,4.54 and 6.12 µg / kg, respectively.The maximum data of The Gerdeh, Champa, Shamim and Fajr, sample, 6.62,6.42,6.68 and 6.9 µg / kg respectivelyand minimum amount of them 6.42,5.24,0.06 and 5.09 respectively (Table 1). Figure 1 shows Average total aflatoxin in the rice samples.

Rice is among the food items in the basket of Iranians. Due to the high consumption of rice by the Iranians considering quality and health, it can have an important role in maintaining and promoting overall health.However, due to the high volume of product, product diversity, different cultures, different weather conditions and other causes of contamination and harmful substances, a variety of factors exist. Among the most important and common infections, fungal infections and contaminated mold can be noted. Aflatoxins and Ochratoxin by a group of the secondary metabolites of fungi that are particularly Aspergillus arise Azqarch. Studies have shown that post-harvest processing as well as applying proper drying and storage to reduce pollution and prevent its spread areis is required (Rustom, 1997)-(Samarajeewa, Sen, & Cohen, 1990). In a study by Kazemi *et al* on rice East Azerbaijan, 23% of the samples were infected. (Department of Planning & Economic Information and Communication Technology Center, 2013-2014). In another study by Rezai on imported rice in Zabol, 6.27% of thesamples hadfungal infection (Center for Statistics and Information Technology Ministry of Agriculture , 2013-2014).

A recent study by (Liu *et al*, 2015) on the 370 rice schema from six provinces in China was conducted to determine aflatoxin and Ochratoxin A 5/63 percent and 9.4 percent, The results showed that the samples contained Ochratoxin a 4.1% of samples were aflatoxin and aflatoxin and 3.0% of samples above the limit Ochratoxin a Europe Union (Farsiani, Marziye, Mahsa, Mohamad reza, & Mahmoud, 2014).Figure 1 shows the present study.Most of that total aflatoxin investigate the prevalence of less than 30 ng per mg, based on Table 1,

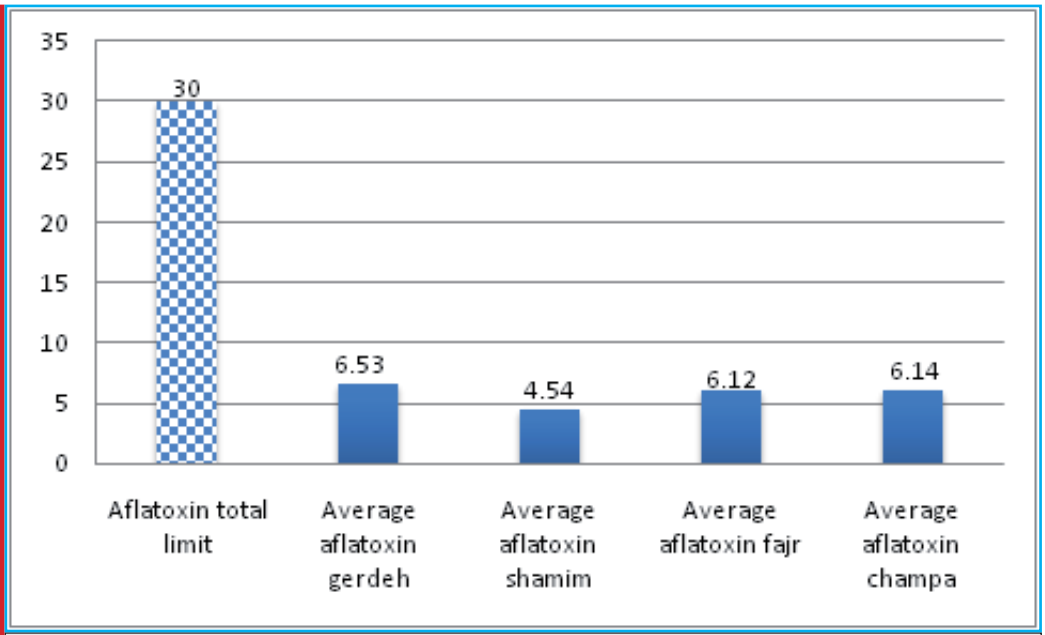

FIGURE 1. Comparison of the average total aflatoxin in the samples with standard limit

the average total aflatoxin in samples examined 83/5 on the ng/mg. In a study by Elena Suárez-Bonnet *et al* (2013), based on the total aflatoxin contamination (B1, G1, B2, and G2) in rice from Mexico and Aspanya, the results showed that the average total aflatoxin of Spanish rice was 37 / 3 micrograms per kg, in the range of 6.1 to 1383 mg/ kg (Suárez-Bonnet, *et al*., 2013).

CONCLUSION

Comparing the results of this study and studies in the country and other countries it can be concluded that the rice examined in this study is more desirable. However, the potential pollution. to the fungus and toxins resulting from it and universal standards in the harvest of all itemsshould beapplied to the provide perfect conditions for transportation and time- consuming maintenance. Another important point is that the cultivation and harvest time or until you quit at the end of bran or less is consumed, the possibility of less contamination is more. The role of temperature in mold growth and toxin production after harvesting isproven and it must be maintained at the right temperature as much as the mold growth is prevented.

REFERENCES

Abdel-Wahhab, M. A., & Kholif, A. (2010). Mycotoxins in animal feeds and prevention strategies. Asian Journal of Animal Sciences, 113-131.

Amanlou, S., Rezaei Khkha, R., Ramazani, A., & Meyer, L. (2014). Contamination of imported rice consumed in Zabol fungi and mycotoxins in 2011. mjlh Jahrom University of Medical Sciences .

Arafa, A., Bloomer, R., Wilson, H., Simpson, C., & Harms, R. (1981). Susceptibility of various poultry species to dietary aflatoxin. British Poultry Science, 431-436.

Cassel, E. K., Campbell, B., Draper, M., & Epperson, B. (2001). Aflatoxins: Hazards in grain/aflatoxicosis and livestock. University of Maryland cooperative extension service , 444-445.

Center for Statistics and Information Technology Ministry of Agriculture . (2013-2014). The area under cultivation and production of some products.

Department of Planning & Economic Information and Communication Technology Center. (2013-2014). The first volume statistics agricultural crops. Tehran: Ministry of Agriculture.

Farsiani, H., Marziye, G., Mahsa, D., Mohamad reza, I., & Mahmoud, A. (2014). To determine the elements present in some species of rice using Laser Induced Breakdown exponential spectrum. Journal of Mazandaran University of Medical Sciences, 24-32.

Fink-Grernmels, J. (1999). Mycotoxins: their implications for human and animal health. Veterinary Quarterly, 115-120.

Food corporation of India. (2011, January 16). fciweb.nic.in. Retrieved January 16, 2011, from fciweb.nic.in: http://fciweb.nic.in/

Institute of Standards and Industrial Research of Iran. (2001). Human-Trap maximum tolerance feed mycotoxins.

Jonathan, W. H., Timothy, D., Pauline, E., Jonathan, K., Curtis, M., & Deepak, A. (2004). Human aflatoxicosis in developing countries: a review of toxicology, exposure, potential health consequences, and interventions. The American journal of clinical nutrition, 1106-1122.

Kazemi, A. H., Mohtadinia, J., Mahdavi, R., Akbari, N., & Salehpour, A. (2008). Mycotoxins are fungi contamination of the rice consumed in the province of East Azerbaijan. Tabriz University of Medical Sciences, 111-118.

Khodabande, N. (2010). Cereals. Tehran: Institute of the University of printed publications.

Khosravi, M. (1998). Evaluation of direct seeding rice, dry method. Jiroft: Azad University.

Majid, R., Hadi, V., Hamid reza, T., Ali, M., Mohammad Ali, A., & Reza, K. (2008). T-2 toxin measurements winter grains in a military center in 2006. Military Medicine, 35-44.

Nader, A., Kobra, K., & Mohammad Javad, T. (2008). Evaluation of aflatoxin contamination of bread losses in Lorestan province in 2008. 87-96.

Payan, R. (2011). Introduction to Technology and cereal products.

Reza, A., Tahereh, S., Alireza, K., &tBahar, S. (2011). Fungal Contamination of food consumed rice farmers. Journal of Mazandaran University of Medical Sciences, 279-285.

Rustom, Y. I. (1997). Aflatoxin in food and feed: occurrence, legislation and inactivation by physical methods. Food chemistry, 57-67.

Samarajeewa, U., Sen, A., & Cohen, M. (1990). Detoxification of Aflatoxins in Feeds and Foods by physical and chemical. Methods. Journal of food protection , 489-501.

Suárez-Bonnet, E., Carvajal, M., Méndez-Ramírez, I., Castillo-Urueta, P., Cortés-Eslava, J., Gómez-Arroyo, S., & Melero-Vara, J. (2013). Aflatoxin (B1, B2, G1, and G2) contamination in rice of Mexico and Spain, from local sources or imported. Journal of food science, T1822-T1829.