

Determination of Mycotoxin in Wheat and Wheat by-product supposed for Human Utilization

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Abstract

The consumption of wheat bran, cereal grains and different cereal merchandise has full-grown in recent years in Brazil. These foods area unit thought of additional nourishing than the refined ones and are related to a reduced risk of some major chronic diseases. On the opposite hand, different analysis, disbursed in Brazil, has found completely different teams of fungi toxins, referred to as mycotoxins, contaminating these wheat merchandise. Among these mycotoxins, area unit the aflatoxins, a bunch of genotoxic and cancer compounds created by *Aspergillus* spp. This study aimed to see the amount of aflatoxins B1, B2, G1 and G2 in samples of cereal grains and derivatives, meant for human consumption, marketed within the metropolitan region of American state Janeiro|Rio|city|metropolis|urban center} de Janeiro, Brazil. 100 and eight samples of cereal grains (n=35), wheat bran (n=32), whole-wheat flour (n=26) and refined flour (n=15) marketed in supermarkets, supermarkets and food stores were analyzed by High Performance Liquid natural action with visible radiation detection (HPLC-FL). 33 samples (30.6%) were positive for a minimum of one mycotoxin and also the B1 type had the very best prevalence within the samples. the general average was zero.69 µg/kg and also the contamination was the very best within the grain samples, followed by bran, whole-flour and refined flour. only one sample showed total aflatoxins levels (B1+B2+G1+G2) more than the limit established by Brazilian legislation (5 µg/kg). the amountgree} found during this study indicated that the presence of aflatoxins in wheat and wheat merchandise consumed in Rio de Janeiro, Brazil, don't seem to be a hazard for public health.

Keywords: mycotoxins, AFB1, wheat bran, cereal merchandise, HPLC

Introduction

Aflatoxins area unit a bunch of structurally connected harmful compounds created by the fungi species *Aspergillus* spp, in the main *A. flavus* and *A. parasiticus*. These species grow on bound foods or feeds below favorable conditions of temperature and humidity [1]. the foremost aflatoxins of concern area unit selected B1, B2, G1, and G2, and area unit classified by the International Agency of analysis on Cancer (IARC) as carcinogens agents to humans (in cluster 1) [2]. they're typically found along in varied foods and also the B1 type has the very best cancer potential among the glorious mycotoxins [3,4]. Since there's no Acceptable Daily Intake (ADI) for aflatoxins, as they're genotoxic and cancer substances, exposure through food ought to be unbroken as low as potential [5].

Cereal grains contaminated with aflatoxins represent a public ill health thanks to the high toxicity of those substances and conjointly as a result of they continue to be partly stable throughout the economic processes

once producing derived merchandise [7,8]. The edge of the wheat will minimize phytotoxin concentrations within the fraction used for human consumption as these toxins area unit decentralised primarily within the bran, that is predominately used for animal feed [9,10]. However, the human consumption of wheat bran as an on the spot supply of dietary fiber has full-grown in recent years, primarily as a result of it's an inexpensive product and incorporates a high dietary fiber content [11]. For this reason, the wheat bran meant for human consumption should have low phytotoxin levels so as to not compromise the security of the ultimate product [12].

In Brazil, there area unit few studies regarding the prevalence of aflatoxins in wheat and wheat merchandise. In different countries, such as, Tunisia, Asian nation and Turkey, high levels of aflatoxins are rumored in wheat and derivatives, that represents a health risk to customers [18,19,20].

This study aimed to see the amount of aflatoxins B1, B2, G1 and G2 in samples of cereal grains and derivatives, meant for human consumption

Sampling

During Gregorian calendar month 2013 to Gregorian calendar month 2014, samples of whole wheat grain (n=35), wheat bran (n=32), whole flour (n=26) and refined flour (n=15) were noninheritable from completely different supermarkets, supermarkets and food stores within the metropolitan region of American state Janeiro|Rio|city|metropolis|urban center} de Janeiro, Brazil, totaling 108 samples. Packets of zero.5 to one weight unit were collected and so transported to the laboratory for analysis.

Chemicals and Reagents

Aflatoxins B1, B2, G1 and G2 standards were purchased from letter (St. Louis, MO, USA). HPLC-grade acetonitrile and methyl alcohol were purchased from Tedia (São Paulo, SP, Brazil). the opposite solvents used for extraction were of analytical grade (Vetec, American state Janeiro|Rio|city|metropolis|urban center} de Janeiro, RJ, Brazil). Deionized water used was obtained from a Milli-Q® purification system (Millipore, MA, USA). Filter papers (No. 1) were purchased from Whatman (Maidstone, UK) and 0.45 µm PVDF membranes (Durapore® thirteen metric linear unit, Millipore) were used for filtration.

Preparation of ordinary Solutions

The standards of aflatoxins B1 (5 mg), B2, G1 and G2 (1 mg) were dissolved in methyl alcohol. Individual stock solutions (50 µg/mL) and dealing solutions (2 µg/mL) were ready by acceptable dilution in methyl alcohol and their concentrations were confirmed by ultraviolet radiation qualitative analysis (Shimadzu UV-1201, Kyoto, Japan), per the Association of Official Analytical Chemists (AOAC) [22].

Aflatoxins Extraction and Derivatization

Aflatoxin determinations were disbursed in triplicate for every one in all the 108 samples. The methodology used for extraction and purification was performed per the Institute Adolfo Lutz [23], with minor variations, as follows. Water (5 mL) at 60°C was supplemental to fifteen g of the grounded sample in Associate in Nursing flask. Then fifty cubic centimeter of chloroform was supplemental to the flask and agitated in an exceedingly Shaker (Orbit Shaker 3520) for forty five min. The chloroform extract was filtered through paper and twenty five cubic centimeter was collected, and so gaseous to status in an exceedingly water bathtub at 65°C below a N2 flow. The dried extract was resuspended with twenty five cubic centimeter

of methyl alcohol in Associate in Nursing ultrasound bathtub (Thornton T7) for ten sec and transferred to a separatory funnel containing twenty five cubic centimeter of NaCl solution (4% w/v). Then twenty five cubic centimeter of solvent was supplemental and also the mixture was stirred smartly for thirty sec, once that the solvent section (top) was discarded. This step was recurrent with another twenty five cubic centimeter of solvent. afterward, twenty five cubic centimeter of chloroform was supplemental to the separatory funnel, with vigorous shaking for thirty sec. This step was recurrent with another twenty five cubic centimeter of chloroform and so gaseous till status in an exceedingly water bathtub at sixty five °C under a N₂ flow. For the mycotoxin extractions from wheat bran double the amount of chloroform was used, and for the analysis of the flours water wasn't supplemental.

HPLC-FL Analysis

The quantification of the aflatoxins was disbursed in an exceedingly High Performance Liquid natural action system, employing a visible radiation detector (Agilent 1100 Series, Waldbronn, Germany) (excitation at 365 nm and emission at 450 nm), a Rheodyne widget (20 µL), a C eighteen column (Ace, 250 mm x 4.6 mm, five µm) Associate in Nursingd an isocratic mobile section, consisting of water: methanol: acetonitrile (7: 2: one, v/v/v) at a rate of flow of one.0 mL min⁻¹. The results were expressed by the mean of the triplicates, in µg/kg.

Statistical Analysis

Statistical analyses were performed victimization Sisvar® five.3 Build seventy seven (UFLA, Brazil). A chance price of zero.05 was accustomed verify the applied math significance in analysis of variance and within the Tukey take a look at.

One hundred and eight wheat and wheat by-products, marketed in American state Janeiro|Rio|city|metropolis|urban center} de Janeiro, Brazil, were analyzed for the presence of aflatoxins B1, B2, G1 and G2. 33 samples (30.6%) were positive for a minimum of one mycotoxin and also the B1 type had the very best prevalence within the samples. it had been detected in twenty seven.8%, with the very best level found in an exceedingly grain sample, corresponded to four.2 µg/kg. The G1 and G2 were detected in just ten.2% and 0.9% of the samples, severally. The B2 type wasn't detected in any sample.

Considering the ecu Union limit for the presence of aflatoxins in wheat (4 µg/kg), one sample of wheat bran containing four.79 µg/kg would even be thought of unfit for human consumption [26]. this legislation regarding mycotoxins prevailing in Brazil came into force in 2011 [12]. once this date, the current study is that the 1st report giving information on levels of aflatoxins in wheat and wheat merchandise meant for human consumption marketed in Brazil. However, additional studies evaluating the prevalence of aflatoxins and different teams of mycotoxins in wheat and derivatives ought to be disbursed in numerous regions of the Brazil, as these foods area unit a vital supply of nutrients for the Brazilian population diet.

From a complete of a hundred and eighty samples analyzed, 33 (30.5%) were positive for a minimum of one mycotoxin and only one sample (wheat grain) showed levels more than the limit established by Brazilian legislation (5 µg/kg). The contamination was the very best within the grain samples, followed by bran, whole-flour and refined flour. the amountgree} found during this study indicate that the presence of aflatoxins in wheat and wheat merchandise consumed in Rio de Janeiro, Brazil, isn't hazard for public health.

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