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RADIATION DEGRADATION OF BIOLOGICAL RESIDUES (AFLATOXINS) PRODUCED IN FOOD LABORATORY

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ABSTRACT

Some molds have the capacity to produce substances that are toxic and generally cancer-causing agents, such as aflatoxins, that stand between the most important carcinogenic substances (class one of the agents which are certainly carcinogenous for human people according to the "International Agency for Research on Cancer"). *Aspergillus* spp. is present in world-wide distribution, with predominance in tropical and subtropical regions growing in any substratum. The aim of this work is establish a minimum dose of radiation that degrades aflatoxins produced by fungi *Aspergillus* spp. The *Aspergillus* spp. colonies will be cultivated in coconut agar medium and the samples will be conditioned in appropriate bags for irradiation treatment of contaminated material and processed in the Gammacell 220 with dose of 20kGy.

1. INTRODUCTION

Aspergillus flavus and *Aspergillus parasiticus* are the most important moulds that produce mycotoxins [1], that are secondary metabolites, and approximately 300 different kinds have been identified, but only 20 are relevant to human health [2].

The aflatoxins had been discovered in 1960 in England, when more then 100.000 turkeys and thousands of ducklings died after consuming peanut meal contaminated with aflatoxin (AFL) [3]. The most common specie of fungi found in this peanut meal was *Aspergillus flavus*, and in a chemical analysis, it was found much kind of toxic compounds that showed fluorescence under violet rays [4]. Aflatoxins are bifuranocumarin mycotoxins produced by *Aspergillus flavus* and *Aspergillus parasiticus* [5].

According the International Agency for Research on Cancer, the aflatoxins are classified as human carcinogens class one [6]. These mycotoxins are not affected by the temperature, resisting in autoclaving at 120˚C for up to one hour [7]. Aflatoxin B_1 is a highly toxic, carcinogenic, mutagenic and teratogenic toxin, being resistant to various physical and chemical treatments [8]. The aim of this work is establish a minimum dose of gamma radiation that degrades aflatoxins produced by *Aspergillus* spp.

2. MATERIAL AND METHODS

2.1. Samples

Sixteen samples of waste coconut agar were collected from Mycotoxins Laboratory of ICB II-USP. The strains of *Aspergillus flavus* were inoculated on to coconut agar medium and incubated for 7 days at 25°C.

2.2. Irradiation

The samples were treated by gamma radiation in the Gammacell 220 with dose of 20kGy and dose rate of 2.79kGy/h. A control group was analyzed to confirm the aflatoxins presence.

2.3. Extraction

Aliquot of 10g of the sample were transferred to a beaker and 30mL of chloroform was added. The mixture was macerated, filtered through filter paper and the chloroform extracts were collected for dryness on a water bath. The dry extract was solubilized in 200µL of chloroform and chromatographed as described by Lin and Dianese [3]. The waste samples were evaluated for the presence of aflatoxins and the fluorescence intensities of the spots formed were measured through comparison with aflatoxin standards under 365nm UV light. The method has a detection limit of 2µg/kg [9].

3. RESULTS AND DISCUSSION

All the control (20µg/mL of $AFLB_1$ and 15µg/mL of $AFLB_2$) samples were positive to the presence of aflatoxins B_1 and B_2. Not detected levels were observed in samples treated with gamma ray processing at dose of 20kGy. The effects of destruction of aflatoxin by gamma radiation are showed in Table 1.

Table 1. Results of detected and not detected levels of aflatoxins in control and irradiated waste coconut agar samples.

Samples	Control (0kGy)	Gamma Ray (20kGy)
1	**+**	**ND**
2	**+**	**ND**
3	**+**	**+**
4	**+**	**+**
5	**+**	**ND**
6	**+**	**ND**
7	**+**	**+**
8	**+**	**+**

C = Control group non irradiated (0 kGy)
ND: Not detected levels (< 2 µg/kg)
(+): Detected levels of aflatoxins (> 2 µg/kg)

This result is in accordance to Aziz and Youssef (2002) that showed a complete destruction of aflatoxin B_1 with a dose of 20kGy [10]. Recently Aquino et al. (2005) showed that aflatoxins B_1 and B_2 are reduced to not detectable levels with a dose of 10kGy [11].

4. CONCLUSIONS

From above research results, it came to the conclusion that the ionizing radiation was effective on degradation of aflatoxins B_1 and B_2 in laboratory waste samples.

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