



## Prevalence of fungal flours in Zahedan-Iran Bakeries

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### ABSTRACT

Fungi widely distributed in nature and the study of fungal toxins is important among the research topics. Many of these toxins enter into the body through foods such as flour, bread and other foods. These toxins could lead to complication such as syndromes and cancer in humans. Due to importance of flour over the diet of Iranian people, the incidence of fungal contamination of flour was done in Zahedan bakeries. In this descriptive study, 113 bakeries were randomly selected from different regions in Zahedan. The samples of flour have cultured in order to identify fungal species with specific medium. 34 out of 113 samples had fungal contamination. The most common mycotoxins – producing fungi were *Acremonium* and *Aspergillus fumigatus* respectively. According to the results of this study and since the bread is the staple of the Iranian people health regulation and monitoring their implementation at all stages of production, distribution and storage of wheat and flour is recommended to the authorities in order to eliminate the fungal contamination and seems to be imperative.

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### KEYWORDS

Flour;  
Fungal contamination;  
Mycotoxins;  
Bakeries;  
Zahedan.

### INTRODUCTION

Rapid growth of population and increasing in food production and agricultural crops, expresses this reality that the requisite supplies of the people around the world encounters more difficulty in provision, maintenance, distribution and consumption. Of improving hygienic culture among people, progress in technology sciences and development of hygiene and also food hygiene, infections and food poisonings caused by bacteria and their toxins have been declined while fungal contaminations of foods and the effects of utilizing such a contaminated meals are increasingly broaden<sup>[1]</sup>. FAO (Food and Agriculture Organization) has evaluated the rate of

disadvantage that the microorganism-contaminated grains inflict to the globe, about 10 percent of total production of the foods<sup>[1,2]</sup>. Fungal contamination of foods inflicts food production and with regards to the route of preparation and maintenance of foods, causes likelihood of contamination of these materials to fungi and at the conclusion production of mycotoxins (4). Fungi along their growth leaving mycotoxins, further of decreasing quantity of the food owing to deletion of fungal contaminated part and reduction of food value owing to the effects on nutrients of the food, that create hard, intense effects such carcinogenesis, teratogenesis and decreasing in growth, mutagenesis and inhibition of immune system in the living animal<sup>[2]</sup>. Mycotoxins or fun-

gal toxins are the primary or secondary metabolic products of fungi<sup>[3]</sup>. A wide range of mold fungi for example *Aspergiloses*, *Penicilium*s, *Fusarium*s and etc. can produce plenty of dangerous mycotoxins<sup>[3]</sup>. Mycotoxins are usually been seen in the components of foods such corn, barley, wheat and peanut. Problem with mycotoxins is not only about the food of the animal or reduction in function of livestock and poultry, but also it exists in meat, milk and egg that could be threatening to the health of human. *Aspergilose*, *Penicilium* and *Fusarium* fungi are more important in production of harmful mycotoxins. The Important mycotoxins are aflatoxins produced by *Aspergillus*<sup>[3,4]</sup>. The B<sub>1</sub>, B<sub>2</sub>, G<sub>1</sub> and G<sub>2</sub> Aflatoxins are the fungal metabolites that produce by means of special species of *Aspergilose parasiticus* and *Aspergilose flavuus* and in the warm and humid regions grains are contaminated to Aflatoxin especially aflatoxin B<sub>1</sub><sup>[1,4]</sup>. The Rey Syndrome, one of the causes of death in children in the southeast of Asia, seems to be from aflatoxin B<sub>1</sub><sup>[5,6]</sup> In addition to production of mycotoxins and other toxic metabolites, some major changes are created in grains owing to the activity of microorganisms, including: decrease of nutritional value of product due to degradation of proteins, lipids and carbohydrates and production of aroma-lowering metabolites, decrease of gluten and as a result lowering the value of processing of flour ; also it influences rheological properties of dough<sup>[1,7]</sup>. Although in most cases moderate temperature of bake is sufficient for eliminating the fungus but some of the mycotoxins may be heat-resistant and may survive along with the process of baking and could enter the human body by the food chain and cause some complications<sup>[1,8]</sup>.

Since the Zahedan city is one of the giants of flour production with grain store pits, factories and wheat and flour mills and according to this reality that grain specially wheat and flour have a major role in nutrition of human, livestock and poultry and higher production is bearing to the sufficiency of province. This survey was conducted to investigate the prevalence of fungal flours in Zahedan (South-East of Iran) bakeries.

## MATERIALS AND METHODS

### Sampling procedure

In this descriptive study, for the aim of surveillance of prevalence of contamination of the flours in the baker-

ies of Zahedan, from 113 bakeries, baking different breads, accidentally and by their geographical distribution sampled. The sampling procedure was applied accidentally and by a 20cm catheter that is usually used in sampling of grain, flour and sugar and sampled from the middle part of five sac of old quota and new quota, existing in the storage of every bakery<sup>[1,8]</sup>.

### Experiment technique

After compiling the samples, in the laboratory, weighed 10 gram of flour sample with 0.01 accuracy. After a bit disinfection with Sodium Hypochlorite % 1 and then repeated washing with distilled water to remove the remaining sodium hypochlorite, a section of the sample was cultivated in sterile conditions under the experimental hood, in the plates comprising of common mycology media, Sabouraud dextrose agar that includes peptone, dextrose and agar and meet primary needs of many fungi. The method that was conducted for removing the . . . . ., caused the suspended fungal spores in the air (that usually are plentiful), remove from the surface of the compound and don't let them to cause confusing results in the experiment therefore in this research it's observed<sup>[9]</sup>.

Samples were stored for 3 weeks in 25°C, and during this period, plates were checked daily from the aspects of fungi growth, distinguishing of different varieties of fungi from each other and recognizing them with regards to macroscopic properties of fungal colonies such as the surface and back color of the colonies, the façade of colonies from the point of having pleat and also the colony surface mood such powdery, . . . . ., cottony, woolen and velvet, and microscopic check of the prepared slide with lacto phenol cotton blue (LCB) from each colony and if it was necessary, cultivation on the slide culture. Then recorded the properties of each.

## RESULTS

This survey exhibited out of 113 samples, 79 samples (%70) without fungal contamination and 34 samples had fungal contamination over the limit of 10<sup>4</sup> colony in a gram of flour. (chart 1). The thirty four contaminated samples, were related to *Aspergillus niger*, *Acromonium*, *Aspergillus fumigatus*, *Penicilium*, *Fusarium*, *Mucour*, *Aspergillus flavuus* and both together *Aspergillus niger* and *Aspergillus fumigates*: *Aspergillu niger* and *Mucour*: *Penicium* and *Mucour*

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together, respectively. Results statistically analyzed by the SPSS version 19 computer software.

### DISCUSSION

Findings of this research showed that fungal contamination of flours of bakeries in Zahedan is remarkable (%30) and over the acceptable limit ( $10^4$  colony per gram of flour) and the most seen fungal species are related to *Aspergillusniger* and *Acromonium*. Among the species been here, *Acromonium*, *Penicilium*, *Aspergillusfumigatus* and *Fusarium* are with importance of toxigenesis that have a high prevalence. This is concerning because mycotoxins derived from these fungi are usually heat-resistant and do not eliminate in the boiling or pasteurization temperature. So they don't remove during the baking process and in the long term cause complications such cancer, liver, gastrointestinal, blood and kidney dysfunction<sup>[10]</sup>.

On the other hand, with consumption of bread wastes in farms and avicultures, existed mycotoxins in bread wastes, enter their meat, milk and dairy products and this toxins usually don't eliminate in milk pasteurization process and this issue shows a new route of entry for this toxins toward the human body and the creation of mycotoxicosis<sup>[14]</sup>.

Several studies in the field of flour contamination has been done in Iran and many regions of the world that has coincidence with the results of current research. In the study that Betina V. in New York in 1989 proceeded the mycotoxins as secondary metabolites that varieties of fungi *Aspergillus*, *Fusarium*, *Penicilium* and *Alternaria* in the wheat flour has been seen significantly<sup>[11]</sup>. In the study of Adb All from Egypt, from 40 harvested wheat samples, % 12.5 of samples were contaminated to Zirelenone. In this survey the mean of contamination was 8.8 ppb<sup>[12]</sup>. In a study by Kazemi et al. in Tabriz city about fungal contamination of flours of bakeries, the most contamination was related to *Aspergillusniger* and *Acromonium*<sup>[1]</sup>.

The proposal that could influence the prevention of microbial contamination of flour products, is observance of an exact hygienic control circle that must be done during the production levels, personnel hygiene and during transportation and maintenance of primary raw materials. Hygiene observance in maintenance of product is due to decreasing the microbial and fungal corruptions. The storage temperature should be under 20°C

and it's recommended that utilize flours with acceptable microbial quality for baking white breads, specially those that have lesser heat-resistant bacterial spores<sup>[1,13,14]</sup>.

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