

The survey of fungal contamination in provincial flour milling industry, Lorestan province, West of Iran

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ABSTRACT

Objective: Wheat is a strategic food crop in Iran. General consumption of wheat enhances the public health risk of probable contamination in the wheat products. Wheat is also exposed to different types of the microbial, fungal and chemical agents which could spoil it. This investigation intends to examine products of the flour milling factories for microbial contaminations.

Methods: Since March to April 2014, 78 samples of flour produced in the factories of Dorood, Borujerd, Khorramabad, Aligoodarz, Koozdasht, Alashtar, Noor Abad, and Pol-e-Dokhtar were provided and submitted to the laboratory of food and drug administration. The total microbial load and mold population were counted by tests conformed to Iran national standard No. 2393.

Results: The obtained results implied the all samples followed microbiological criteria for total microbial load and mold counting.

Conclusions: All samples were acceptable and consumable so wheat milling process in the factories of Lorestan province carried out under sanitary condition.

KEY WORDS: wheat flour, provincial factories, mold, milling industry.

1. INTRODUCTION

The starchy plants such as wheat, rice, maize, millet and tuberous crops like potato provide main sources of food in developing countries (Majnoon-Hoseini, 1996). Wheat is an important strategic food crop in human life and certainly its contamination will affect public health around the world. Wheat could be contaminated by microbial agents in farms or silos (Cabanas, 2008; Tabuc, 2009; Prange, 2005; Anli and Alkis, 2010; Czaban, 2006). The global wheat demand increases because of several competitive advantages such as climate tolerance, long term storage, cheapness, high nutritional value and variety of products. Wheat not only plays a crucial role in human nutrition, but also it could be useful in the animal husbandry and industrial activities. Wheat is a nutrient-rich food source because of containing substantial amounts of protein, carbohydrate, fat, minerals and vitamins. Flour is the primary ingredient of baking breads and some related food manufacturing process like pasta and incorporates into the worldwide people diets. Bread is the major daily source of protein, minerals and B-group vitamins (Shahedi and sharyati, 1998). Although many researches have noticed the hygienic quality of pastry products, these types of foods are still exposed to different biological and chemical contaminations (Teymori, 2014; El-sherbeeney, 1985; Teymori, 2014; Wartzentruber, 1982; Soltan Dallal, 2001; Beumer and Leijendekkers, 1996; Rayman, 1981; Halt, 2004).

Nowadays infectious diseases such as human and food infection as the most well-known diseases have become more common and cause suffering human with serious problems, especially in undeveloped countries (Fatholahzadeh, 2009; Asadollahi, 2012; Taherikalani, 2011; Fatholahzadeh, 2009; Emaneini, 2009; Jabalameli, 2011; Soroush, 2010; Taherikalani, 2008; Pakzad, 2011; Shahsavan, 2012; Haghi-Ashteiiani, 2007; Khoramrooz, 2012; Asadollahi, 2011; Akbari, 2010; Jabalameli, 2012; Sahebekhtiari, 2011; Kalantari, 2007; Nakhjavani, 2013).

Grains and cereals are prone to microbial growth under suitable conditions (Deibel and Swanson, 2001). The low water activity of flour causes being acclaimed for low health risk capacity (ICMSF, 1998). Although the dryness may prevent microbial growth, many photogenic microorganisms could survive in them for a long time (Lana Berghofer, 2003). Consequently there are many reports on implication of flour contamination in food poisoning (Moffatt, 2006; Much, 2005; Kimura, 2008).

The yeasts and molds are eukaryotic heterotrophic microorganisms that are able to grow in acidic and alkaline environments of food or water. Molds and yeasts which are responsible for food spoilage, secrets some harmful metabolites and compounds associated with human and animal diseases. There are many examples of the moldy bread related poisoning (Rokni, 2007). The quality of bread and other related food are mainly affected by wheat and flour sanitary manufacturing. The objective of this study is determination of flour milling hygiene in Lorestan province factories.

2. MATERIALS AND METHODS

2.1. Sampling: This study was done on flour mills in Lorestan province of Iran since March 2014 to April 2015. Randomly, 78 samples of produced wheat flour were collected and sent to official control laboratory of Deputy for Food and Drug, Lorestan University of Medical Sciences. Total microbial load and molds number were measured, as stated in Iran national standard protocol for assessment of flours microbial count (No. 2393). The standard limits of microbial contamination have been mentioned in table.1.

Table.1. The standard microbial load range for wheat flour samples

Microorganism	Acceptable limit (cfu/ml)
Total count	$<10^{+5}$
Mould	$<5 \times 10^{+3}$

2.2. Mold count: A total of 1 mL of the desired dilution (10^{-1} or 10^{-2}) was spread on the plate count agar medium and incubated at 25 °C for 5-3 days.

2.3. Total count: A total of 1 mL of desired dilution (10^{-1} to 10^{-5}) pour plated in sterile plate count agar culture mediums and incubated at 30 °C for 24-48 h.

3. RESULTS

The microbial tests done on 78 samples of flour proved that 100% of samples conformed to standard flour milling products showing lower mold load contamination than acceptable range.

4. DISCUSSION

Dalal and colleagues published an article about microbial load of wheat flour in Jajrood city of Iran and informed that 9.4% of products were inconsumable based on standard criteria (Soltan Dalal, 2002). A research carried out by Sadeghi and co-workers revealed that 18% and 36.1% of produced wheat flour in factories of Ilam city of Iran were respectively spoiled by *Salmonella* sp. and molds (Sadeghi, 2014). Asadzade' team obtained result that was similar to ours. They declared that all samples collected from West Azerbaijan province of Iran were located in standard range (Asadzadeh, 2014).

Essential oils and extract of Iranian hebal plants have several antioxidant and bioactive compounds which those have antimicrobial effect on any types of bacterium such as gram-negative and gram-positive bacterium. Therefore, they can be used for safeguarding of food and decreased of microbial quality (Bahmani, 2014; Delfan, 2014; Bahmani, 2014; Bahmani, 2015; Sarrafchi, 2015; Bahmani, 2014; Delfan, 2014; Bahmani, 2014; Asadi-Samani, 2014; Saki, 2014; Bahmani, 2014; Delfan, 2014; Bahmani, 2014; Karamati, 2014; Bahmani, 2014; Saki, 2014; Bahmani, 2014; Asadbeygi, 2014; Bahmani, 2014; Karamati, 2014; Bahmani, 2014).

Therefore, flour milling factories product in Lorestan fulfilled the desired microbial quality that presented efficiency of continuous control system. Indeed, preservation of the situation depends on keeping on diligent control and even improves by giving boost to environment sanitation, individual laboral hygiene, machines and equipment, packing materials and water consumption. The regulation of wheat's moisture, air conditioning in silos and mills and heat exchange in production line could also impeded microbial growth.

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