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The microbial quality assessment of confectionary products in Lorestan province, West of Iran

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ABSTRACT

Objective: Food and nutrition services are one of the major sources of chemical and biological contamination. It has been anticipated that more than 70% of infectious diseases establish after consuming contaminated foods. Sanitary quality control seems more imperative considering that the confections cover a large proportion of food products in Iran. The purpose of this study is determination of microbial community and presence of Salmonella, Staphylococcus aureus, Escherichia coli, Enterobacteriacea, mold and yeast in confections supplied to Lorestan province.
Methods: This research offers a descriptive and analytical perspective on sanitary status of confectionary products during March to April of 2014. Samples included 350 of different types of cake, biscuit, wafer, eclair and cookie which were transported to central food laboratory.
Results: According to the tests results 4.28% of eclair samples were contaminated with *Enterobacteriaceae* out of acceptable range and other samples conform to the prescribed hygiene standards. Totally 0.85% of 350 collected samples were out of standard range. The difference between our result and other researches is related to diversity of sampling time, weather temperature, microbial culture conformity and manufacturing process.
Conclusions: The low rate of contamination might appreciate regard for sanitary condition by labors.

KEY WORDS: confectionary products, microbial contamination, fungi, Lorestan province, Iran.

1. INTRODUCTION

Confectionary products are a main part of food manufacturing in Iran. They are divided into two types of products based on ingredients, food manufacturing process and preservation, bakers' confections and sugar confections (ISIRI, 2014). If products were heated they might be spoiled by some thermo tolerant spores. Some confections which contain more water are exposed to further contamination. Bakers' confections are safer than sugar confections because of their instructions and composition. Although, some syrups or powders that are used after baking process for cookies decoration could implicate in contamination. In addition, using industrial equipment can decrease hygienic risks. However some products might be contaminated by osmophilic yeast, lipase secreted by microorganisms and bacteria in case of moisture environment (ISIRI, 2014).

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, 2008; 2011; Emaneini, 2009; Jabalameli, 2011; Soroush, 2010; Pakzad, 2011; Shahsavan, 2012; Haghi-Ashteiani, 2007; Khoramrooz, 2012; Asadollahi, 2011; Akbari, 2010; Jabalameli, 2012; Sahebekhtiari, 2011; Kalantari, 2007; Nakhjavani, 2013).

Food safety policy is one of the important implementation of public health organizations. Even though food quality assurance has improved in recent years, the incidence of food poisoning and chemical's morbidity is still prevalent in many countries. Food-born infection may end in diseases, death and financial detriment (Velusamy, 2010; Marandi, 1999; Mead, 1999; Newell, 2010). Food and nutrition services are one of the major sources of chemical and biological contaminations. It has been anticipated that more than 70% of infectious diseases establish after consuming contaminated foods and more than 450 types of viral, parasitical, fungal and bacterial infections are associated with food pathogens (Velusamy, 2010). United States Centers for Disease Control and Prevention (CDC) has reported that 76,000,000 American people are affected by food-borne infections and 325,000 of patients are hospitalized or killed while the consequence medical care cost $6.5 to 34 billion a year. Worryingly, WHO has estimated that 300 to 350 fold of cases remain unreported. Unfortunately there is no statistical information on people who suffer from food-borne illness in Iran (Mead, 1999). Microbial agents and toxins cause disorders by different mechanisms. Bacteria, viruses and parasites respectively are the most important causes of food-borne sickness (Mozafari, 2002). *Botulism, Campylobacteriosis, Shigellosis, Salmonellosis, E. coli* infections are the most popular food-related infections (Mosaferi, 2007; Fadaei, 2008).

Industrialized food processing and manufacturing condition demand different levels of quality control and more surveys. Considering a significant tendency to consume confections among our people, this study was carried out to evaluate sanitary condition of the confectionary market in Loerstan province.

2. MATERIALS AND METHODS

This research offers a descriptive and analytical perspective on sanitary status of confectionary products during March to April of 2014. Samples included 350 of different types of cake, biscuit, wafer, éclair and cookie which were collected from 8 cities by random sampling.

2.1. Sampling: Sampling was conducted over a years (2014) and were submitted to laboratory. During this period 350 samples were collected for running bacterial and fungal tests.

2.2. Mold and yeast enumeration: Mold colony count was done by standard method for counting 1 and 2-10899 (LQS-W505112, 127). Based on test instruction, 5 gr of confectionary products is mixed with 45 mg Ringer's solution and 0-1 diluted sample were mixed. 0-1 ml of the prepared suspension was placed onto agar plates containing DG18 and incubated for 18-24 hours at 30°C and bacterial colonies were counted manually and were estimated using the following formula (ISIRI, 2014). $N = \sum a / V(N_1 + 0.1N_2)D$

In this formula, $\sum a$ is the total number of mold and yeast colonies on selective media, V is total fertility per page per ml, N_1 is early count of colonies on selective media after dilution, N2: Second count of colonies on selective media after dilution, D is dilution factor according to the colony accumulation on selective media.

Coagulase-positive Staphylococcus aureus counting: For enumeration of Staphylococcus aureus (coagulase-positive) Iranian National Standard No.6806 was used, If black colonies observed, the sample test was assumed positive (ISIRI, 2012).

2.3. Escherichia coli counting: 1 cc of sterile sample was poured and added to laurel sulfate tryptose medium. Then, it was incubated at 37°C. If gas was formed, the sample was reported as negative; and if the gas were produced, the test result was assumed positive. Samples that formed gas were taken and added to the second tube. One tube was added to peptone water tube and incubated at 44 ° C and other tubes were purred into the EC broth. On the third day, if the EC broth gas production was positive, it would be added to peptone water medium. Ultimately microbial population of tubes should be counted (ISIRI, 2011).

2.4. Enterobacter counting: 5gr of cake sample was weighted and added to 45 ml Ringer's solution and after 10 min, the supernatant was used as a dilution of 0.1 (ISIRI, 2010) ml solution of 0.1dilution was removed and transferred to the medium plate till inoculated plates and two-thirds VRBDA (bile in red, purple) to be in good condition, after spreading layer and inverse of incubation at 37°C to be for 1-2 days, If pink colonies were observed, the entrobactria colonies were identified and should be used in oxide test (negative) and positive coagulase colonies. For counting, colonies were counted and multiplied by the dilution factor. The number was reported based on food amount (ISIRI, 2010).

2.5. Salmonella counting: 5gr cake samples was added to 45 ml sterile peptone water and incubated at 37°C for 1-2 days. Then, 0.1 ml of each medium was transferred to peptone water and 1mL was added into a tube which contained Tetratiosyanat and was incubated for 1-2 days. Then, 0.1 ml of solution was streaked on shigella-salmonella agar and was incubated for 1-2 days at 37°C (ISIRI, 2009). Pink or red colonies were suspected of salmonella and confirmatory tests were necessary. The standard microbial load range for milk samples are shown in the table 1.

Table.1.The standard microbial load range for milk sample

Products	Microorganism					
	Salmonella	***Escherichia coli***	***Staphylococcus areus***	***Enterobacteriaceae***	**Mould**	**Yeast**
Cake	0	0	0	<10	<10	<10
Cookie	0	0	0	<10	<10	<10
wafer	0	0	0	<10	<10	<10
éclair	0	0	0	<10	<10	<10
biscuit	0	0	0	<10	<10	<10

3. RESULTS

The obtained results demonstrated low contamination rate of confectionery products. Table.2.

Table.2. Bacterial and fungal contamination rate in confections

products	microorganisms					
	Salmonella	***Escherichia coli***	***Staphylococcus areus***	***Enterobacteriaceae***	**Mould**	**yeast**
Cake	negative	negative	negative	negative	negative	negative
Cookie	negative	negative	negative	negative	negative	negative
Wafer	negative	negative	negative	negative	negative	negative
Eclair	negative	negative	negative	4.28%	negative	negative
Biscuit	negative	negative	negative	negative	negative	negative

As it has been shown in table.2, 4.28% of éclair samples were determined inconsumable and contaminated by enterobacteria.

4. CONCLUSION

Presented results and similar researches confirmed that hygienic risk of high moisture confectionary products are more than other types.

A study that carried out in Mashhad city of Iran has reported 26% contamination with *E.coli* and 69% with coliforms in eclair products (Khezri, 2007). A research in Fars province also has mentioned 69% contamination of cream supplied in confectioneries (Khalili, 2007). Some researchers in Zahedan city of Iran have measured 53.83% coliforms and E.coli related contamination in éclair confections (Shadan, 2004). Based on running the same tests in Tabriz city of Iran different microbial agents contributed in contamination, 70% by yeast, 48.8 % by *E.coli*, 38.8% by coliforms, 31.2% by *Staphylococcus aureus* and 27.5% by molds.

Essential oils and extract of Iranian hebal plants have several antioxidant and bioactive compounds which those have antimicrobial effect on any types of bactrium such as gram-negative and gram-positive bacterium. Therefore, they can be used for safeguarding of food and decreased of microbial quality (Bahmani, 2014; 2015; Delfan, 2014; Sarrafchi, 2015; Asadi-Samani, 2014; Saki, 2014; Karamati, 2014; Asadbeygi, 2014). The difference between our result and pervious result might happen because of variant sampling time, weather and temperature, microbial culture conformity and manufacturing process. The low rate of contamination might appreciate regard for sanitary condition by labors that are one of the critical control point of semi-industrial and nonindustrial food processing in developing countries.

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