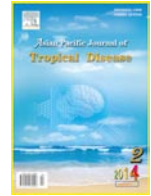




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Evaluation of microbial contamination of produced juice and concentrate in West Azarbaijan Province, north west of Iran

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ABSTRACT

Objective: To evaluate the microbial quality of the industrial produced fruit juices in West Azerbaijan Province of Iran.

Methods: In this study, 150 samples of produced juices were studied for the presence of acid resistant bacteria, lactic acid bacteria, mold and yeasts using national standard methods of Iran.

Results: Obtained results showed that 100% of all fruit juice samples were devoid of any microbes.

Conclusions: This study showed that consuming of industrial produced fruit juices are recommended because of their hygienic conditions of production and no existence of microbial contamination. While fresh fruit juices are contaminated with various microorganisms due to unsanitary conditions, therefore, their consuming are not recommended.

1. Introduction

Food is considered as one of the survival factors of all organisms that without it they can not survive more than a few days. Food is useful for the body when it would be perfect and free of contaminants[1].

Although, many techniques are used for food preservation, food pathogens are still a major problem in the food industry. Some of these techniques are appropriate, but many of them reduce tend to consuming of preserved products and enhance the resistance of food pathogens in the environment[2].

Safety of food is a common issue of the food industries and consumers. According to numerous reports of food

contaminations and considering popular health providing appropriate strategies to more protection of food is necessary[3].

As one of the best drinks provide significant part of human's needing vitamins, fruit juices have various minerals and vitamins, and compensating body's water losing[4,5].

Foods including fruit juices are in exposures to different physical, chemical and biological contaminants, have a suitable environment for the growth of some pathogens, and naturally could be pathogenic[6,7].

Water, soil, sewage, animals and air caused contamination on surfaces of fruits and plants. Presence of pathogens in fruit juices causes food borne diseases in the consumers. The investigations showed that common pathogenic bacteria that contaminated fruit juices are coliforms, fecal coliforms, *Staphylococcus aureus* and mesophilic bacteria[8–11].

Presence of humidity (70%–90%), sugar-containing acidic environment is favorable for the growth of molds and yeasts. It is a suitable medium for the growth of them.

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Molds and yeasts that can grow in fruit juices are able to produce mycotoxins which are poisonous to humans and animals^[12,13].

The aim of this study was to investigate the microbial quality of the industrial produced fruit juices in West Azerbaijan Province, at the north west of Iran, due to its good climate, high fruit orchards and producing many types of fruit in there, large number of fruit juice and concentrate factories and high export to abroad.

2. Materials and methods

2.1. Sampling

With a selected sample of 150 juices samples from the several brands in during March to October of 2012 includes juice production from fruits such as apples, pomegranates, peaches, oranges, pineapple, apricot, cherry, kiwi, lemon, mango, grapes, strawberries, bananas, malt beverages, soft drinks, etc., were sent to the laboratory for specific tests.

2.2. Enumeration of mold and yeast

Enumeration of colony of mold was used from standard method for counting the number 1 and 2–10899 (LQS–W5051126 and 127). A total of 5 g of rice were mixed in 45 mL of Ringer's solution that prepared diluted with 0.1 of the sample is obtained. A total of 0.1 mL of the prepared suspension in plates containing DG–18 agar is played by swab and incubated for 18–24 h at 30 °C and bacterial colonies is calculated by the following formula^[14,15]. Reference methods used for mold and yeast assessment of fruit juices.

$$N = \Sigma a/V (n1+0.1n2) d$$

In this formula: Σa is total colony count of mold or yeast in selected plates, V is total inoculated per plate per mL, $n1$ is the first dilution plate count number of selected, $n2$ is the second count of the number plate of the selected dilution, d is dilution factor according to the selected dilution^[14,15].

2.3. Enumeration of acid-resistant bacteria

For each factor test sample, 2 mL were picked and transferred to sterile plates (1 mL was added to each plate) and then about 15 mL of the medium, the temperature at about 45 °C, is added to the plate. Sample mix with sample and its environment on the solid surface and cool place (5 d at 30 °C). After getting a solid medium plate in the proper time and temperature, do incubation. After of predetermined period of plates and microorganisms be counted^[16]. Reference methods used for acid-resistant bacteria assessment of fruit juices is indicated in Table 1.

Table 1

Reference methods used for microbial assessment of fruit juices.

No.	Test	Acceptability limit	Reference method
1	Acid resistant bacteria	Negative	Iran national standard no. 3845
2	Lactic acid bacteria	Negative	Iran national standard no. 3414
3	Mold	Negative	Iran national standard no.10899
4	Yeast	Negative	Iran national standard no.10899

2.4. Enumeration of lactic acid bacteria

A total of 2 mL of sample is added to the plate. Then 15 mL of culture medium was added to it and mixed them up and set it down on a solid flat surface and let it cool. The plates incubated upside down at 37 °C for 3 d. After the review period, plates and formed colonies were counted^[17].

3. Results

According to Iranian national standards, acid resistant bacteria, lactic acid bacteria, yeast and molds count is zero. Obtained results showed that all 150 samples were free of microorganisms, indicating the good quality of produced fruit juices. All of 150 samples from microbial quality of industrial fruit juices such as acid resistant bacteria, lactic acid bacteria, mold and yeast were negative.

4. Discussion

Based on the obtained results of this study, 100% of all fruit juice samples were devoid of any microbe which reflects this fact that all of the samples were consumable and have produced with respect to hygienic conditions, standards. Presence of even a small number of microbes is unauthorized in fruit juices.

In a study done in the Netherlands, unpasteurized fresh juices were introduced as a risk factor for intestinal diseases^[10]. Another study about fruit juices microbial quality in street vendors of India showed juices contained high microbial load of coliforms, fecal coliforms and *Staphylococcus aureus* and vibrio^[18].

In a study on the microbial quality of fruit juices in Libya *Staphylococcus aureus* of 5.5%, *Escherichia coli* (*E. coli*) of 2.1%, coliforms of 22.6%, *Pseudomonas aeruginosa* of 4.1%, *Candida albicans* of 12.3% and yeast in 58.2% of samples were isolated^[9].

Al-Jedah and Robinson's study showed that coliform, *E. coli*, mold and yeast are as a marker for the assessment of hygiene standards, *Pseudomonas aeruginosa* as an indicator of water pollution and *Staphylococcus aureus* and *Enterococcus faecalis* are indicators to poor hygiene of persons in contact with the fruit juices^[9,4].

In an evaluation of microbial quality of fresh fruit juices in Bandar Abbas city of Iran among the 146 samples, 142 samples were contaminated with at least one microorganism. In this study, 100% of the carrots and mango juice samples were contaminated. Mean value contamination were 86.2% with coliforms, 56.6% with yeasts, 53.2% and 57% with mesophilic bacteria and *E. coli*, respectively^[19].

High microbial load of fruit juices can be caused by: fruits poor quality and improperly washing, contamination of ice used for fruits freezing, non-hygienic containers or peeling of fruits^[20].

Study of Asgari *et al.* in Ilam city of Iran showed that 60% of fresh fruit juice samples were contaminated with *E. coli*, 73.33% with coliforms, 44.66% with aerobic bacteria, 73.33% with *Staphylococcus aureus*, and 63.33% with yeast. Mold

contamination was not observed in samples^[21].

In a study done in bojnord city of Iran, it was found that 73% of fruit juices were contaminated with *E. coli*^[22]. In another study in Tehran city of Iran 94.6% carrots juice samples and 87.7% coconut milk samples had microbial contamination and were useless^[23]. In Khoramabad city of Iran 84% of fresh fruit juices were contaminated with coliforms^[1]. In another study in Yasuj city of Iran contamination with *E. coli* was found in fruit juices^[24]. Several studies showed that fresh fruit juices are contaminated with pathogen microorganisms that endanger human health.

Conflict of interest statement

We declare that we have no conflict of interest.

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