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Research Article

Study the concentrations of Cd, Pb, Ni, Zn and microbial quality in some kinds of candy

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Abstract

Twenty samples of candy sweet were related to Turkish and china's companies collected from local Iraqi markets to measure the concentrations of some heavy metals (Cd, Pb , Ni and Zn) , also evaluate the microbial quality includes: bacteria and fungi in these tested products.

The results revealed that most of studied samples do not exceed the acceptable values were proposed from both WHO and Iraqi standards except the samples N and T. The same results were recorded for Pb concentrations except the J, L and S samples which recorded 0.081, 0.071 and 0.092 ppm , respectively.

The concentrations of Ni recorded 0.03,0.05,nil,nil,0.06 and 0.01 ppm , respectively in the samples F,I,L,R and 20.The previous values less than the acceptable limits but other exceed thes values, while the samples do not recorded values that exceed the acceptable limits of Zn in WHO or Iraqi standards.

Bacterial growth was recognize in the samples A,C,I,J,L,O,P,Q and R with numbers 46,9,31,11,1,11,24,19 and CFU\g , respectively.

Also , yeast found in the following studied samples F,G,J,L,M,N and T, respectively. but do not recorded in other samples, while molds were founding with the following numbers 1,34,39,11,17,7,16,17,9,6,25,13,29 and 8 CFU\ g in the samples A,B,C,D,E,G,I,J,K,N,O,P,Q and R, respectively .

According to the previous results, it can conclude that the tested samples of candy not suitable for healthy use by children.

Keywords: food contamination , heavy metals , microbial contamination of food.

Introduction

The word “package” refers to a container that provide a means of protecting, marketing, or handling a product, and it includes a unit package,

an intermediate package, and a shipping container. In many countries, various plastic materials are used in food packaging, and most of them are printed by color inks on the outer cover. Importantly, food products such as candies that are

likely to be consumed frequently by children are wrapped in colorful packages in order to induce them to purchase the products. Heavy metal such as lead, chromium, and copper, can be put onto the children's hands that hold candies. Due to their frequent hand-to-mouth behavior, children are likely to be posed by ingesting these heavy metals [1]. Recently, there is an increasing concern about the quality of imported foods and food related products in several parts of the world [2]. Additionally, many products are brought into the country by travelers especially residents travelling back and forth regularly to the country. Among the common products imported are chocolates, candies, biscuits, bean paste, bean curd, teas and various nuts and spices [3]. Contamination of imported food products with heavy metals may cause a serious risk for human health because of the consumption of even small amount of metals can lead to considerable concentrations in human body there leading to bio toxic effects. The bio toxic effects of heavy metals refer to the harmful effects of heavy metals to the body when consumed above the bio-recommended limits. Although individual metals exhibit specific signs of their toxicity, the following have been reported as general signs associated with cadmium, lead, arsenic, mercury, zinc, copper and aluminum poisoning: gastrointestinal (GI) disorders, diarrhea, stomatitis, tremor, hemoglobinuria causing a rust-red color to stool, ataxia, paralysis, vomiting and convulsion, depression, and pneumonia when volatile vapors and fumes are inhaled [4]. Essential trace metals are beneficial when present below the limit of tolerance, but can be toxic if taken in excess. This transition between essentiality and toxicity varies from element to element. Substantial evidence supports the importance of trace elements in human nutrition. These trace elements play a crucial role in various biochemical functions of the body as some of these forms are integral enzyme cofactors. Water used for juice preparation can be a major source of microbial contaminants such as total coliforms, faecal coliforms, faecal streptococci, etc. Environmental formites may also make the fruits unsafe and these may have a role in the

spread of *Salmonella*, *Shigella*, *Vibrio*, *Escherichia coli* and other and cause diseases as well fruit spoilage [5]. Spoilage yeasts such as *Saccharomyces cerevisiae*, *Candida lipolytica* and *Zygosaccharomyces* spp. Can tolerate acidic environments. It should also be noted that changes in pH could transform a food into one which can support the growth of pathogens [6].

Materials and methods

Sampling:

Twenty samples of commonly consumed sweets products were imported from many Turkey and China countries were collected randomly from Iraqi local markets. These samples were represents 20 companies. The information relevant to nutritional composition, ingredients, weight, manufacturer and country of origin were recorded. The analysis to determinate the concentrations of some heavy metals includes: Cadmium, Copper, Nickel, Lead and Zinc, by using Atomic Spectrophotometer (AAS) according to [7,8]. Bacterial and fungal analysis (coli form, fecal coli form and total plate counts (TPC) were depends in order to evaluation the bacterial quality of these samples [9]. All samples test depend on triple replications.

Preparation of sample solution:

Soon after the collection of samples, they were weighed and solutions of samples were prepared

Digestion method:

For the determination of selected heavy metals, about 10 ± 0.001 g of samples was homogenized and weighed, 10 ml of concentrated HNO_3 were added to the selected sample ,both of them but in beaker . The beaker was covered with a watch glass, and after most of the sample was dissolved by standing overnight, it was then heated on a hot plate with boiling until any vigorous reaction had subsided. The solution was allowed to cool, transferred into a 50 ml volumetric flask and diluted to the mark with distilled water [7].

Microbiological analysis of collected sweets samples:

For the quantitative determination of total count of mesophilic bacteria, the standard procedure

described by [6] was followed. Aerobic plate count (APC) was performed by pour plate method using plate count agar (PCA), which was incubated at $35\pm10^{\circ}\text{C}$ for $48\pm2\text{h}$. Enumeration of fungi was performed on Potato Dextrose Agar medium.

Table:1 The concentrations of Cd ,Zn ,Ni and Pb in candy samples.

Samples	Cd	Zn	Ni	Pb
1	0.006	0.078	0.14	0.026
2	0.009	Nil	0.22	0.029
3	0.008	0.134	0.36	0.033
4	0.005	0.119	0.59	0.035
5	0.004	0.224	0.93	0.024
6	0.006	0.137	0.03	0.036
7	0.009	0.235	0.14	Nil
8	0.003	0.138	0.36	0.021
9	0.007	Nil	0.05	0.038
10	0.003	0.120	0.64	0.092
11	0.002	0.143	0.77	Nil
12	0.004	0.060	Nil	0.081
13	0.03	Nil	0.98	0.043
14	0.07	0.012	0.46	0.027
15	0.009	0.098	0.53	0.013
16	0.004	0.076	0.61	0.037
17	0.02	Nil	Nil	Nil
18	0.004	0.180	0.06	Nil
19	0.008	0.156	0.43	0.071
20	0.06	Nil	0.01	0.009

Table2: Mean and(\pm) Sd of studied samples

Metals	Mean (\pm)Sd
Cd	0.136 \pm 0.0188 ac
Zn	0.0955 \pm 0.0759 adf
Ni	0.3655 \pm 0.316 beg
Pb	0.0308 \pm 0.026 cfh

Table:3 Total plate count for both bacteria and fungi in studied samples(CFU\g).

Samples	Bacteria	Fungi	
		Yeast	Molds
A	46	0	1
B	0	0	34
C	9	0	39
D	0	0	11
E	0	0	17
F	0	6	0
G	0	1	7
H	0	0	0
I	31	0	6
J	11	5	17
K	0	0	9
L	1	14	0
M	0	1	0
N	0	0	6
O	11	0	25
P	24	0	13
Q	19	14	29
R	1	0	8
S	0	0	0
T	0	7	0

Results and Discussion

The results explain that most the recorded values of Cd in candies samples were less than the acceptable values (0.05ppm) which proposed by [9] and 0.005ppm of Iraqi standard. These results were identical to the results were recorder by [10], except the two samples N and T (0.07 ,0.06), respectively were exceed the Iraqi limits and WHO permissible values(Tables 1-2).

The recorded concentrations values of Pb in candies samples were less the acceptable values less than 0.05ppm of WHO except the samples L,S and J (0.081,0.071,0.092)mg/gm, respectively and most of recorded values of Pb were exceeded the acceptable values (0.01ppm) of Iraqi standard,

except the sample 20 (0.009 ppm) was less than the Iraqi standard limits(Tables 1-2).

While Ni concentrations in candies samples were exceeded the acceptable values (0.1ppm) of US-EPA and Iraqi standard except the samples (F,I,L,R and T) , recorded concentrations were (0.03, 0.05 , Nil, Nil , 0.06 , 0.01 ppm), respectively(Tables 1-2).

The values of Zn in all candies samples were less than the acceptable values of WHO and Iraqi standard. It was found there is a significant differences between Cd and Ni ,Zn and Ni and also between Ni and pb, but no significant differences were notice between Cd and Zn ;Cd and Pb, and also between Ni and Pb . According to ANOVA analysis

there is a significant differences among all the studied metals.

The presence of *E. coli*, *Enterococcus*, *Klebsiella spp*, *Staphylococcus aureus*, is of concern and further support the possibility of fecal contamination of products due to poor sanitation [11]. *Bacillus* and *Pseudomonas spp* were isolated; however, *Salmonella* and *Shigella spp* were not detected. These organisms are known to be environmental contaminants and opportunistic pathogens [12], have been implicated in food borne diseases, and are known to cause food spoilage that can lead to economic loss. The most predominant bacterial contaminants was *S. aureus* with 25.56% this could be traced to the fact that it is abundant in human body as example in skin, nails and hair [13-15]. Similarly, *Bacillus cereus* showed high percentage 18%, its presence can be traced to the fact that it's abundant spore former in soil, air and water, hence can easily be present in these foods. The presence of *Aspergillus*, *Penicillium* and *Mucor* could be attributed to the surrounding air and packaging materials [16,17]. *Aspergillus spp* are very common fungal agent of food borne illness [18]. Fungi are common environmental contaminants and the moulds bear resistant spores that easily contaminate surfaces and can resist the juice condition [19]. Also, it was found that the major causes of spoilage of fruits and vegetables [20].

The results of microbial analyses explain that some the recorded numbers of bacteria in candies samples were exceeded the acceptable values (1×10^4 CFU/g) of [21] in the samples A ,I , L, O, P and Q (46, 31,1,11,24,19 CFU/ml), respectively (Table-3) .

According the The acceptable numbers of molds in candies , sweets and jelly are not more than (50CFU/g) , where recorded in candies sampler about (1, 34, 39, 11, 17, 7, 6,17,9, 6,25,13,29,8 CFU/ml in the samples A,B, C,D,E,G,I,J,K,N,O,P,Q and R , respectively [21] .

According the acceptable values of yeast in candies and sweets and jelly are not more than (10 CFU/g). The results of fungal analyses explain that some the recorded numbers of yeast in candies samples were exceeded the acceptable values (10 CFU/g) of 14, 14 CFU/ml in Land Q ,respectively. Also, there is no yeast growth in all candies sample[21].

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