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Research Article

DETERMINATION OF SOME HEAVY METALS IN SOME ARTIFICIAL FRUIT JUICES IN IRAQI LOCAL MARKETS

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ABSTRACT

Some heavy metals concentrations (Cadmium, Copper, Nickel, Lead and Zinc) were measured in 20 samples of different artificial fruits juices were imported from different Arabian countries and these samples were so common in Iraqi markets. The results indicate that all the studied samples (100%) were exceed the local and international permissible values of Cadmium and copper, while 60% of them were exceeded the acceptable values of Nickel. Also, it was found that 15% of the studied samples are with high concentrations of lead which exceeded the Iraqi standard and about 35% of them exceeded the limits values of WHO. Zinc concentrations were still with the acceptable range for all the samples.

Keywords: heavy metals, Cadmium, Copper, Nickel, Lead, Zinc, artificial fruits juices.

INTRODUCTION

Environmental pollution is the main cause of heavy metals contamination in the food chain.Heavy metals are potential environmental contaminants with the capability of causing human health problems if present to excess in the food we eat. They are given special attention throughout the world due to their effects even at very low concentrations (1).several cases of human disease, disorders, malfunction and malformation of organs due to metal toxicity have been reported (2). Heavy metals composition of food is of interest because of their essential or toxic nature. For example, iron , zinc, copper , chromium , cobalt, and manganese are essential, while lead, cadmium, nickel, and mercury are toxic at certain levels(3).Arsenic is a highly toxic element and its presence in food composites is a matter of concern to the humans well-being(4).After acute and chronic exposures, it causes a variety of adverse health effects to humans such as dermal changes , respiratory , pulmonary , cardiovascular , gastrointestinal, hematological, hepatic, renal, neurological, developmental, reproductive, immunologic, genotoxic, mutagenic and carcinogenic effects (5). Diet is the major source of heavy metals exposure; therefore, it is important to monitor the dietary intake of these heavy metals to quantify them, and during the last years there was a significant increase in consumers interest for natural fruits juices (6), there is a great interest in monitoring the mineral content of juices as well as to identify the juice mineral pattern which can be considered the first step in the determination of juice authenticity. However the determination of juice authenticity involves many analytical methodologies and can be handled only in complex multidisciplinary laboratories (7). In this study , about 20 of more common companies were selected to test their samples of artificial fruits juices andmeasure the concentrations of some heavy metals includes: cadmium , copper, nickel, lead and zinc, in order to comparative the

results values with acceptable values were proposed by Iraqi standard and WHO.

Materials and Methods:

Sixty samples of commonly consumed canned fruit juices (imported from many Arabian countries, about 20 companies), were analysis to determinate the concentrations of some heavy metals includes: Cadmium,Copper,Nickel, Lead and Zinc, by using Atomic Spectrophotometer (AAS) to determinate the concentrations (AOAC, 1996, 2003). Bacterial and fungalanalysis (coliform, fecal coliform and total plate counts (TPC) were depends in order to evaluation the bacterial quality of these samples (WHO, 2006).

Statically Analysis:

Data was analyzed by using complete program SPSS-IBM Version 21.mean ISE and ANOVA table, T-test was used to analyze the present data.

Results and Discussion:

Heavy metals are widely found in our environment, human are exposed to these metals with capability of causing health problem if present to excess in the food we eat (1). **S**everal cases of human disease, disorders, malfunction and malformation of organ due to metals toxicity has been reported (2).

Cadmium intake in relatively high amount can be detrimental to human health. Over a long period of intake, cadmium may accumulate in the kidney and liver, and because of its long biological half-life, may lead to kidney damage (11).

The results explains that the range and mean of cadmium in all the studies samples (Tables.1 and 2) were exceed the acceptable values (0.005 ppm and 0.05 ppm) which proposed by WHO and Iraqi Standard,respectively. These results may identical to the results were recorded by other researches (12).

The efficiency of Copper is manifested by impaired hematopoiesis, bone metabolism, disorders of digestive, cardiovascular and nervous systems (13).

The results explains that all the recorded values of Copper in juice samples were exceeded the acceptable values (less than o.o1ppm) of WHO and 0.05ppm of Iraqi standard, these results were identical to the results were recorder by (14). Table (3) shows that 80% of the samples have nickel levels which exceeded the maximum contaminant level (0.10 ppm) set by US EPA and Iraqi standard.

Table (1): Mean ±SD of heavy metals (ppm) characteristics of canned juices.

Samples	Cd	Cu	Ni	Pb	Zn
1	0.02 ±0.03	0.07	0.11	0.01	0.07
		±0.03	0.00	0.00	0.00
2	1.52	0.08	0.14	0.09	0.05
	±0.03	0.00	±0.03	0.00	±0.03
3	1.74	0.07	0.13	0.08	0.04
	±0.03	0.00	±0.03	0.00	±0.03
4	0.01	0.08	0.12	0.01	0.07
	0.00	±0.03	±0.03	±0.03	0.00
5	0.01	0.06	0.24	0.01	0.06
	0.00	±0.03	±0.03	0.00	0.00
6	0.70	0.11	0.24	0.02	0.08
	±0.03	0.00	0.00	0.00	0.00
7	1.05	0.22	1.10	0.09	0.12
	0.00	±0.03	0.00	0.00	0.00
8	0.01	0.07	2.40	0.01	0.04
	0.00	±0.03	±0.03	0.00	±0.03
9	0.76	0.07	0.24	0.01	0.05
	±0.03	0.00	0.00	±0.03	±0.03
10	0.01	0.05	0.11	0.01	0.07
	0.00	0.00	0.00	0.00	0.00
11	0.01	0.07	0.11	0.01	0.05
	0.00	0.00	±0.03	0.00	±0.03
12	0.02	0.05	0.12	0.01	0.03
	0.00	0.00	±0.03	0.00	±0.03
13	1.96	0.08	0.28	0.10	0.06
	±0.03	0.00	±0.03	±0.03	0.00
14	0.02	0.04	0.11	0.01	0.05
	0.00	0.00	0.00	0.00	0.00
15	0.53	0.05	0.07	0.02	0.06
	±0.03	±0.03	0.00	±0.03	±0.03
16	1.46	0.13	0.20	0.04	0.21
	±0.03	±0.03	0.00	0.00	±0.03
17	0.64	0.07	0.12	0.01	0.17
	±0.03	0.00	±0.03	±0.03	±0.03
18	2.36	0.08	0.34	0.04	0.25
	±0.03	0.00	±0.03	±0.03	0.00
19	0.02	0.06	0.07	0.01	0.06
	0.00	±0.03	0.00	0.00	0.00
20	0.02	0.08	0.04	0.01	0.06
	0.00	±0.03	±0.03	0.00	±0.03

Table (2): Range of heavy metals in canned juice (ppm)

Samples	Cd	Cu	Ni	Pb	Zn
1	0.01-0.02	0.07-0.08	0.11-0.11	0.01-0.01	0.07-0.07
2	1.52-1.53	0.08-0.08	0.14-0.15	0.09-0.09	0.05-0.06
3	1.74-1.75	0.07-0.07	0.13-0.14	0.08-0.08	0.04-0.05
4	0.01-0.01	0.08-0.09	0.11-0.13	0.01-0.02	0.07-0.07
5	0.01-0.01	0.06-0.07	0.24-0.25	0.01-0.01	0.06-0.06
6	0.70-0.71	0.11-0.11	0.24-0.24	0.02-0.02	0.08-0.08
7	1.05-1.05	0.22-0.23	1.10-1.10	0.09-0.09	0.12-0.12
8	0.01-0.01	0.07-0.08	2.40-2.50	0.01-0.01	0.04-0.05
9	0.76-0.77	0.07-0.07	0.24-0.24	0.01-0.02	0.05-0.06
10	0.01-0.01	0.05-0.05	0.11-0.11	0.01-0.01	0.07-0.07
11	0.01-0.01	0.07-0.07	0.11-0.12	0.01-0.01	0.05-0.06
12	0.02-0.02	0.05-0.05	0.12-0.13	0.01-0.01	0.03-0.04
13	1.90-2	0.08-0.08	0.28-0.29	0.10-0.11	0.06-0.06
14	0.02-0.02	0.04-0.04	0.11-0.11	0.01-0.01	0.05-0.05
15	0.53-0.54	0.05-0.06	0.07-0.07	0.02-0.03	0.06-0.07
16	1.46-1.47	0.13-0.14	0.20-0.20	0.04-0.04	0.21-0.22
17	0.64-0.65	0.07-0.07	0.12-0.13	0.01-0.02	0.17-0.18
18	2.30-2.40	0.08-0.08	0.34-0.35	0.04-0.05	0.25-0.25
19	0.02-0.02	0.06-0.07	0.07-0.07	0.01-0.01	0.06-0.06
20	0.02-0.02	0.08-0.09	0.04-0.05	0.01-0.01	0.06-0.07

Table 3: The percentage of Contaminated Studied Samples

Samples Numbers	Cd	Cu	Ni	Pb	Zn
20 kinds (3 replicates) 60 samples	**100%** Contaminated All samples exceeded the permissible values	**100%** contaminated All samples exceeded the permissible values	**60%** of samples exceeded the permissible of Iraqi standard and US-WHO	**15%** of the samples exceeded theIraqi standard **AND 35%** of the samples exceeded the WHO limits	No samples were exceeded the values of Iraqi standard and US-WHO.

Table 4: ANOVA analysis and probability at> 0.05

	Sum of squares	df	Mean square	F	Sig.
Cd between	34.631	19	1.823	5257.739	**0.000**
Groups	0.14	40	0.000		
Total	34.645	59			
Cu between	0.091	19	0.005	319.035	**0.000**
Groups	0.001	40	0.000		
Total	0.092	59			
Ni between	17.404	19	0.916	4883.775	**0.000**
Groups	0.008	40	0.000		
Total	17.412	59			
Pb between	0.060	19	0.003	317.684	**0.000**
Groups	0.000	40	0.000		
Total	0.061	59			
Zn between	0.199	19	0.010	628.395	**0.000**
Groups	0.001	40	0.000		
Total	0.200	59			

Table 5: Bacterial and Fungal Analysis of the Studied Samples.

Samples	Coliform	Fecal Coliform	Total plate count	Fungal account
1	**0**	**0**	**14**	**0**
2	**0**	**0**	**0**	**0**
3	**0**	**0**	**0**	**0**
4	**0**	**0**	**0**	**0**
5	**0**	**0**	**0**	**0**
6	**0**	**0**	**0**	**0**
7	**0**	**0**	**0**	**0**
8	**0**	**0**	**0**	**0**
9	**0**	**0**	**0**	**0**
10	**0**	**0**	**0**	**0**
11	**0**	**0**	**0**	**0**
12	**0**	**0**	**0**	**0**
13	**0**	**0**	**0**	**0**
14	**0**	**0**	**0**	**0**
15	**0**	**0**	**0**	**0**
16	**0**	**0**	**0**	**0**
17	**0**	**0**	**0**	**0**
18	**0**	**0**	**0**	**0**
19	**0**	**0**	**11**	**0**
20	**0**	**0**	**4**	**0**

Lead toxicity causes many diseases like anemia, anoxia, bone pair, brain damage, convulsion and dizziness (15).

About 15% of samples were exceed the Iraqi standard limits (0.05ppm) and about 35% of these samples were exceeded the acceptable values of WHO (0.01ppm). All the results were properly less than results were recorded by (16).

The toxicity of zinc due to excessive intake may lead to electrolyte imbalance, nausea, anemia, and lethargy (17).

Table 2 indicate there is no samples were exceeded the Iraqi limits (0.2ppm) for zinc concentrations. The statically analysis (Table 4) explains there is significant differences between the samples or among the metals, at probability

>0.05. Bacterial results appears there is no bacterial growth in most samples except in 1, 19 and 20 samples, since the bacterial numbers were about 14, 11 and 4 cell\100ml, respectively (Table 5)

Several factors encourage, present or limit the growth of microorganisms in juices; the most important pH, hygienic practice and storage temperature and concentration of the preservative, storage of products at refrigerator temperature or below is not always best for the maintenance of desirable quality of some fruits. Water used for juice preparation can be a major source of microbial contaminates such as total coliform, fecal coliform, fecal streptococcus (18). Also, there is no fungal growth in all the studied samples (Table 5).

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