

The Chemical and Biological Pollution of Potato and Corn Chips

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Abstract

This study was conducted to investigate the levels of some heavy metals (Fe, pb and Cd) and also some metals such as (Ca ,Na and K) were estimated in some brands of potato and corn chips selected from the local market of Hilla city in Iraq in October 2013. Atomic absorption spectrometry was used to evaluate levels of heavy metals whereas flame photometry was used to estimate the other metals (Ca , Na and K) Biological study was carried out for determining the total number of bacteria and fungi. The results showed that the mean of metals in potato chips was found as follow 5330 , 2125 , 60 , 1.59 , 7.73 and 0.43 mg/kg for Na , K , Ca , Fe , Pb and Cd respectively , where as it 2270 , 6650 , 465 , 4.40 , 11.86 and 0.266 mg/kg in corn chips respectively. The levels of heavy metals in potato chips were higher than corn chips samples except cadmium as shown in this study whereas Na , K and ca were higher in corn chips samples than those in potato chips. The results of biological study revealed that aerobic bacteria, coli form bacteria and pathogenic staphylococcus were Identified in both samples (potato and corn chips). Chips may have been contaminated during the manufacturing process or in the packing or from raw materials .

Keywords: Potato chips, corn chips etc.

1. Introduction

Food pollution means the presence in food or associated with food of toxic chemicals and or biological contaminants which are naturally present in food or are above their natural back ground levels (for those chemicals which are naturally found in some foods, this may affect each of us by causing mild to severe food illness or even worse contributing or causing the development of serious health problems such as hormonal and metabolism problems or even various type of cancer⁽¹⁾.

Potato and Corn chips are considered as snack foods that can polluted.

Snack food are often subjectively classified as junk food because they typically have little or no nutritional value and are not seen as contributing to wards general health and nutrition .

A potato chips or crisp is a thin slice of potato that has been deep friend or baked.

The basic potato and corn chips are cooked and salted and they are a portion of food often smaller than a regular meal eaten between meals⁽²⁾.

Lays is one a very popular brand of potato chips lays classic potato chips have no preservatives or additives , they have no cholesterol and they have healthy polyunsaturated and mono unsaturated fats⁽³⁾.

Corn chips have the strong aroma and flavor or roasted corn and are often heavily dusted with salt⁽⁴⁾⁽⁵⁾.

Potato and corn chips polluted in heavy metals such as lead, cadmium etc.

The contamination caused from environment or through chips processing.

Potentially environmental contaminants with the capability of causing to human health this occurs when they are found largely in food and consumed excessively by human, this idea is of great concern due to their toxic effects on human body at very low concentration and evaluate the concentration of health risk found in the studied with the respect to value of minimal risk level⁽⁶⁾.

Heavy metal become toxic when they are not metabolized by the body and accumulate in the soft tissues, they may enter the human body through water, air or absorption through the skin when they come in contact with humans⁽⁷⁾⁽⁸⁾.

Heavy metals with adverse health effects in human metabolism (including lead and cadmium) present obvious concerns due to their persistence in the environment and documented potential for serious consequence⁽⁹⁾.

Cadmium is an extremely toxic metal commonly found in industrial workplaces.

Due to its low permissible exposure limit over exposure may occur even in situations where trace quantities are found⁽¹⁰⁾.

Table -1 Quantity of some metals in corn chips mg/kg

Element type chips type	Na	K	Ca	Fe	Pb	Cd
Bocher	5200	1750	675	1.64	8.76	0.23
Basat	5500	2500	685	1.54	6.72	0.63
Mean of two brands	5350	2125	680	1.59	7.73	0.43

Table -2-The average of some heavy metals (mg/kg) in potato and corn chips in different countries

Country	chips type	Fe	Pb	Cd
Saudia	Potato chips	10.38	2.11	0.26
Arabia	Corn chip	6.05	5.34	0.21
Kuwait	Potato chips	6.05	5.34	0.23
	Corn chips	-----	-----	0.21
Turkey	Potato chips	-----	2.8	-----
	Corn chips	10.37	1.42	0.14

Table -3 Quantities of some metals in potato chips mg/km

Element type chips type	Na	K	Ca	Fe	Pb	cd
Hendrin	1180	3500	550	4.32	12.20	0.292
lays	3400	9800	380	4.48	11.50	0.240
Mean of two brands	2270	6650	465	4.40	11.86	0.266

Table - 4 Biological contaminations of potato and corn chips

Chips sample Media name	Potato chips		Corn chips	
	Lays	Hendrin	Bochar	basat
Nutrient Agar	Aerobic bacteria	Candida rhizopus	Aerobic Bacteria	
Potato dextrose Agar	Aspergillus candida		Pencilium	A.flavusPencilium
Macconkey Agar	E.coliKlebsiella	E .coil	E.coliKlebsiella	E .coil
Mannitol salt Agar	S.epidermidiss	S.aereus	S.aereus	S.aereus

Lead poisoning is a medical condition in human and other caused by increased levels of heavy metals lead in body ⁽¹¹⁾.

Lead interferes with variety of body processes and is toxic to many organs and tissues and therefore particularly toxic to children ⁽¹²⁾.

Iron poisoning is an iron over load caused by a large excess of iron intake and usually refers to an acute over load than a gradual one, the term has been primary associated with young children ⁽¹³⁾.

Biological contamination which means the pollutions caused by any living organisms including bacteria, viruses, fungi etc.

Which have been hazard to human beings Bacteria, Fungi and other species as the alien species can directly or including allergy respiratory diseases, digestive system, nervous system , blood system and may be caused cancer ⁽¹⁴⁾.

Potato and corn chips environmentally contaminated with bacteria and Fungi or through the processing.

The biological contaminated chips cause serious and sometime fatal infections in young children or elderly

people and others with weakened immune system nausea , vomiting and abdominal pain other study found that the resistant starch corn chips was difficult to digest and may be cause colon cancer ⁽¹⁵⁾.

Now days potato and corn chips are widely consumed all over the world especially by young and children ⁽¹⁶⁾.

The objective of this study is to estimate the levels of heavy metals and some other metals in potato and corn chips consumed in Iraq and the biological contamination of them.

Materials and methods

Twenty five samples of potato and corn chips were collected randomly from the market of Hilla city during October 2013 representing four different types of chips.

The samples were milled and dried at 150 C⁰ for one hour before chemical analysis to estimate the metals (Fe, pb and cd) by using atomic absorption spectrometer. Whereas the metals (Na, K and Ca) they burned to 550 c⁰ in (oven) and then evaluated by flame photometer.

In microbial study many types of media were used (Plate count agar to determining the total number of

bacteria, malt agar for determining coli form bacteria mannitol salt agar for determining the pathogenic staphylococci, staphylococcus aureus, s. epidermis.

The plate were then incubated for between 18-24 h/37c⁰ for bacteria and one week for fungi at room temp. Colony were randomly selected based, on their colonial characteristics and streaked for purity on nutrient agar and sabouraud dextrose agar respectively⁽¹⁵⁾.

Results and discussions

AS shown from table (1) that quantity of heavy metals from corn chips (1.59, 7.73 and 0.43) mg/kg for (Fe, pb and cd respectively).

When we compare the content of heavy metals (Fe, pb and Cd) in corn chips with other countries as shown in table (2).

There is a danger levels in our study especially in pb and cadmium because they have highest levels in contrast with Saudia Arabia, Kuwait and Turkey.

Whereas the quantity of Na, K and Ca were 5350, 2125 and 680 mg/kg as shown in table (1).

As shown from table (3) the quantity of heavy metals in potato chips were 4.40, 11.86 and 0.266 for Fe, pb and cadmium in sequence

Table -4- revealed that aerobic bacteria, coliform bacteria and pathogenic staphylococcus were identified in potato and corn chips may have been contaminated during the manufacturing processes in the packing period or in the crude materials⁽¹⁶⁾.

The results showed that the fungi were isolated from chips based on their cultural and morphological characteristics include *Aspergillus flavus*, *Rhizopus* sp. and *Candida* sp⁽¹⁷⁾.

The condition and the environmental factors of the stored chips such as temperature, aeration, PH and moisture that aid fungi in chips which cause spoilage and deterioration and production toxic substances⁽¹⁸⁾.

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