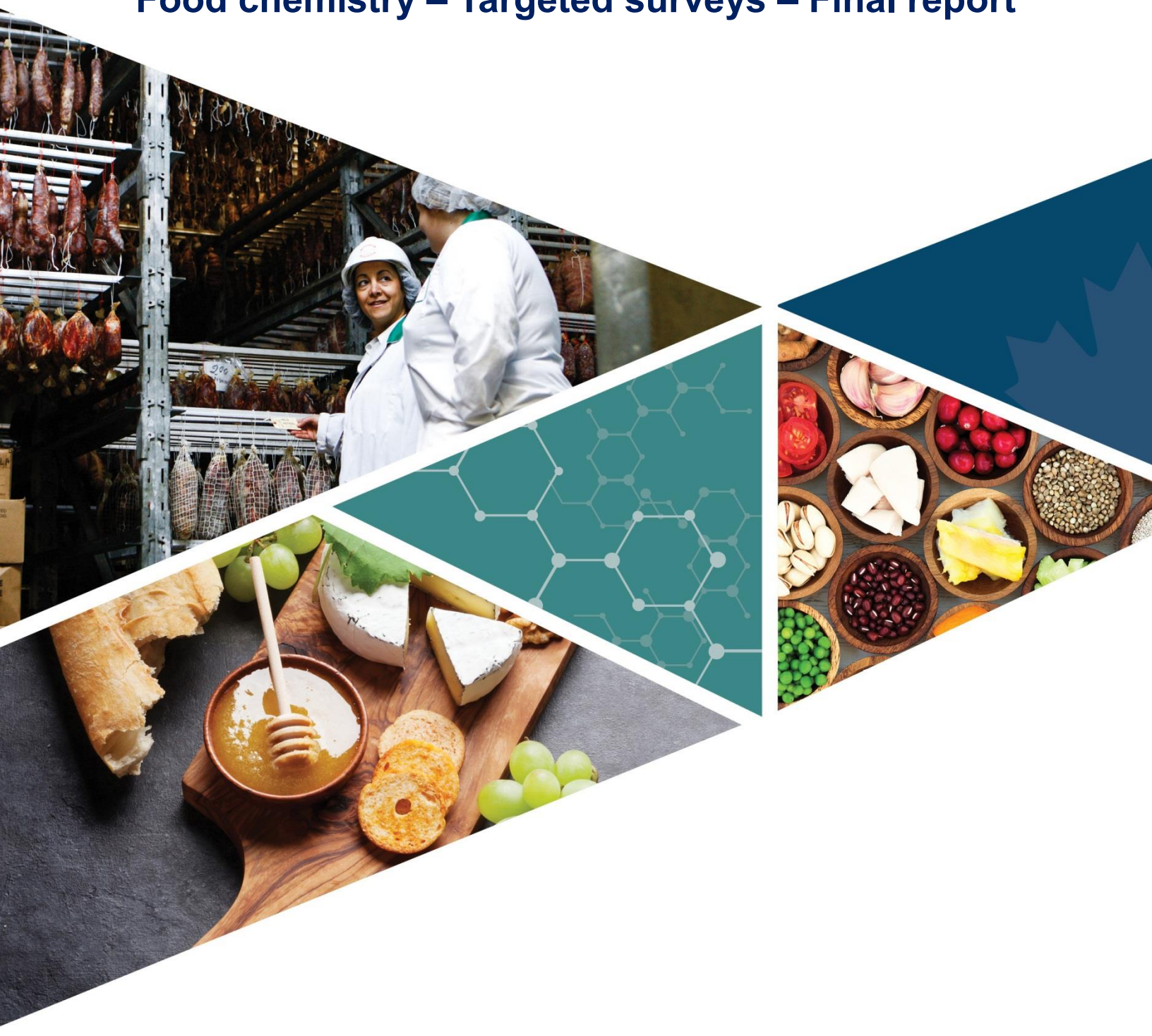
Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

Aflatoxins in Selected Spices, Oilseeds, Rice and Rice Products – April 1, 2015 to March 31, 2016

Food chemistry – Targeted surveys – Final report



Summary

Targeted surveys provide information on potential food hazards and enhance the Canadian Food Inspection Agency's (CFIA's) routine monitoring programs. These surveys provide evidence regarding the safety of the food supply, identify potential emerging hazards, and contribute new information and data to food categories where it may be limited or non-existent. They are often used by the CFIA to focus surveillance on potential areas of higher risk. Surveys can also help to identify trends and provide information about how industry complies with Canadian regulations.

Aflatoxins are a family of mycotoxins (naturally-occurring and toxic secondary metabolites) produced by *Aspergillus* fungi. Hot, humid conditions and pest damage during plant growth or storage can favour the growth of aflatoxin-producing fungi, leading to the presence of aflatoxins in foods. Aflatoxins are known to occur in nuts and nut products, dried foods, grains, spices and cocoa beans. This survey targeted spices, oilseeds (such as sunflower seeds) and rice and rice products.

To look at the levels of aflatoxins present in foods in the Canadian market, the CFIA carried out a retail survey of foods likely to contain aflatoxins. In this survey, 981 products were sampled. Aflatoxins were found in 11% of samples tested. There are currently no limits for aflatoxin in spices, oilseeds or rice and rice products in Canada but there is a limit of 15 ppb of total aflatoxin in nuts and nut products. All high results of aflatoxin are reviewed by Health Canada's Bureau of Chemical Safety to determine if aflatoxin levels are harmful to consumers. Levels found in this survey were considered safe for consumption by Canadians and no product recalls were required.

What are targeted surveys

Targeted surveys are used by the CFIA to focus its surveillance activities on areas of highest health risk. The information gained from these surveys provides support for the allocation and prioritization of the Agency's activities to areas of greater concern. Originally started as a project under the Food Safety Action Plan (FSAP), targeted surveys have been embedded in the CFIA's regular surveillance activities since 2013. Targeted surveys are a valuable tool for generating information on certain hazards in foods, identifying and characterizing new and emerging hazards, informing trend analysis, prompting and refining health risk assessments, highlighting potential contamination issues, as well as assessing and promoting compliance with Canadian regulations.

Food safety is a shared responsibility. The CFIA works with federal, provincial, territorial and municipal governments and provides regulatory oversight of the food industry to promote safe handling of foods throughout the food production chain. The food industry and retail sectors in Canada are responsible for the food they produce and sell, while individual consumers are responsible for the safe handling of the food they have in their possession.

Why did we conduct this survey

Aflatoxins are naturally occurring mycotoxins produced by *Aspergillus* fungi[1]. The 4 main aflatoxins are AFB_1, AFG_1, AFB_2 and AFG_2. The B_1 form is the predominant and most toxic form of aflatoxin[2]. Short term exposure to high levels of aflatoxins can cause vomiting, abdominal pain and death[2]. Long term exposure to higher levels of aflatoxins, specifically AFB_1, has been linked to liver cancer and liver disease as well as preventing proper growth in children[2]. It is important to note that exposure to high levels of aflatoxins is very rare in developed countries.

Aflatoxins can be present in foods such as nuts and nut products, spices, rice, dried foods, grains and cocoa beans[1]. During growth and harvest phases of food, moulds can be produced as a result of hot and humid conditions and pest damage resulting in aflatoxin contamination[1]. The major route of human exposure to aflatoxins is through the consumption of contaminated foods directly or as ingredients[2]. This survey provided a snapshot of the levels found in food products that are available in Canada.

What did we sample

A variety of domestic and imported spices, oilseeds, rice and rice products were sampled between April 1, 2015 to March 31, 2016. Samples of products were collected from local/regional retail locations located in 6 major cities across Canada. These cities encompassed 4 Canadian geographical areas: Atlantic (Halifax), Quebec (Montreal), Ontario (Toronto and Ottawa) and the West (Vancouver and Calgary). The number of samples collected

from these cities was in proportion to the relative population of the respective areas. Refer to Table 1 for the product types collected in this survey.

Table 1. Distribution of samples based on product type and origin

Product type	Number of domestic samples	Number of imported samples	Number of samples of unspecified origin[a]	Total number of samples
Spices	24	124	339	487
Oilseeds	34	69	92	195
Rice and rice products	39	163	97	299
Total samples	**97**	**356**	**518**	**981**

[a]Unspecified refers to those samples for which a country of origin could not be assigned from the product label or available sample information

How were samples analyzed and assessed

Samples were analyzed by an ISO/IEC 17025 accredited food testing laboratory under contract with the Government of Canada. The samples were tested for total aflatoxins (AFB_1, AFG_1, AFB_2 and AFG_2) as sold or tested as is and not prepared according to package instructions.

Currently, there are no limits set for aflatoxins in Canada for spices, oilseeds or rice and rice products, but there is a limit of 15 ppb for total aflatoxins in nuts and nut butters. All high results of aflatoxin are reviewed by Health Canada's Bureau of Chemical Safety to determine if the levels are harmful to consumers. Levels in this survey were considered safe for consumption by Canadians and no product recalls were required.

What were the survey results

Of the 981 samples tested, 871 (89%) did not have detected levels of aflatoxin. Of the samples where aflatoxins were detected, a range of concentrations was observed and is presented in Table 2. Average levels of aflatoxins were highest in spices and lowest in rice and rice products.

Spices

No aflatoxins were detected in 79% of spice samples with the highest average detected concentrations found in turmeric and ginger powder at 29.3 ppb and 26.4 ppb. There were no detected levels in chili seasoning or dried chili pepper.

Oilseeds

No aflatoxins were found in 98% of oilseed samples with the highest average detected concentrations found in melon seeds (2.6 ppb). There were no detected levels in soy beans, sesame seeds and sunflower seeds.

Rice and rice products

Aflatoxins were not detected in 98% of rice and rice product samples with the highest average detected concentrations in rice flour (2 ppb). There were no detected levels in rice beverage, rice bran and rice products.

Table 2. Levels of aflatoxin in spices, oilseeds and rice and rice products.

Product type	Number of samples	Number of samples (%) with detected levels	Minimum (ppb)	Maximum (ppb)	Average[b] (ppb)
Spices	487	100 (21)	0	122.9	17.4
Oilseeds	195	4 (2)	0	4.5	2.6
Rice and rice products	299	6 (2)	0	2.9	1.9

[b]Only positive results were used to calculate average aflatoxins levels

What do the survey results mean

Table 3. Minimum, maximum and average concentration of total aflatoxins across various studies

Product type	Study	Number of samples	Number of samples (%) with detected levels	Minimum (ppb)	Maximum (ppb)	Average (ppb)[c]
Spices	CFIA (current survey)	487	100 (21)	0	122.9	17.4
	CFIA Survey 2013 to 2014	94	16 (17)	0	72.2	11.5
	CFIA Survey 2012 to 2013	49	34 (69)	0	43.7	4.0
Rice and rice	CFIA (current	299	6 (2)	0	2.9	1.9

products	survey)					
	Bansal et al. (2009)	100	43 (43)	<LOD[c]	3.5	0.39
	Bansal et al.(2008)	99	56 (56)	<LOD[c]	7.1	0.34
Melon seeds	CFIA (current survey)	46	4 (8.7)	0	4.5	2.6
	Feizy (2011)	65	58 (89)	<LOD[c]	50 to 200	8.3

[c]Limit of detection

In comparison to previous survey years, the percentage of samples with detected levels of aflatoxin was consistent for the 2013 to 2014 CFIA survey[3] and the current survey for spices. The percentage of positive spice samples was 21% for the current survey and 17% for the previous survey, however, it was 69% in 2012 to 2013[4]. This is potentially due to the different spices that were tested each year. More than 10 varieties of spices were sampled in 2013 to 2014 and 2015 to 2016 whereas the 2012 to 2013 survey tested paprika and chili powder samples only[3,4].

Rice and rice products showed an increase in the percentage of positive samples from 2008 and 2009 in comparison to the current survey, however the average and maximum concentrations of aflatoxin were comparable. The percentage of positive samples could be attributed to the difference in rice samples tested. Rice grain samples were tested in 2008 and 2009 whereas the current survey also tested rice product samples such as rice beverage, snacks, flour, etc. Studies in 2008 and 2009[5] only included AFB_1 concentrations and do not represent total aflatoxin results which would explain the lower average concentration in comparison to the current survey year.

Oilseeds have not been sampled and tested in previous CFIA surveys. Melon seeds were the only positive oilseed samples in this survey, so the results were compared to a 2011 survey of aflatoxins in melon seeds from Iran[6]. There were 65 samples from Iran tested for aflatoxins with 89% of samples with detected levels. Levels and number of positives were much higher in comparison to this survey.

Since there are presently no Canadian maximum levels for aflatoxins in the products tested in this survey, all positives were assessed on a case by case basis by Health Canada. It was ultimately determined by Health Canada that all positive samples reported did not represent a risk to Canadian consumers.

The CFIA survey results show that spices, rice and rice products and oilseeds are safe for consumption. There were no follow-up actions resulting from this survey. Future targeted surveys will focus on corn products, nuts and nut butters.

References

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