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

Sulphites in Selected Foods – April 1, 2015 to March 31, 2019

Food chemistry - Food Safety Oversight Monitoring Program – Final report

Canada

Summary

The Food Safety Oversight Monitoring Program (FSO) is an annual Canadian Food Inspection Agency (CFIA) surveillance program which verifies compliance in foods to Canadian standards and guidelines for chemical residues, allergens and contaminants. FSO was created to strengthen inspection and program delivery for non-meat sectors such as fish, bakery products, fresh fruit and vegetables. The data collected from this program along with other surveillance activities enables the CFIA to identify trends that may warrant additional control strategies to maintain or improve compliance.

The FSO is one of several tools that the CFIA employs to help maintain the high compliance observed year after year. The FSO is carried out in accordance with Codex Alimentarius principles and guidelines and is an important part of the CFIA food safety framework that monitors Canadian foods for potential hazards. This program provides data to support the Canadian food production system and the integrity of Canada's chemical residue control system. These systems are equivalent to those of our main trading partners like the United States and the European Union.

Sulphites are sulphur-based substances used as preservatives to prevent spoilage and discoloration during storage and distribution of foods. In the fresh produce industry, sulphur dioxide (SO_2) gas is commonly used to fumigate table grapes against decay during storage, or is used in packaging material for grapes by slow-emission of SO_2 during transportation[1]. Sulphites are considered a priority food allergen and can cause an allergic-like reaction in sulphite-sensitive people. In Canada, with the exception of grapes, they are not permitted for use on any other fresh fruit or vegetable intended to be consumed raw.

The data from this monitoring program provided information on the use and levels of sulphites in fresh cut fruit and fruit salads, canned and pre-packaged fruit, and on the rind and flesh of imported fresh fruit. A total of 593 samples of fresh cut fruit/fruit salads, canned and pre-packaged fruit contained no detectable levels of sulphites. A total of 1177 samples of fresh imported fruit were tested for sulphites. 26 different types of imported fruit were tested for sulphites. Overall, sulphites were present in the rind of 87 samples (7.4%) and the flesh of 10 samples (0.8%). Cherimoya, longan, lychee and tamarind were the only fruit samples that contained sulphites. Lychee had the highest percentage (74.5%) of samples that contained sulphites, longan had 55.8%, tamarind with 3.6% and cherimoya with 2.4%.

Positive results were followed up by the CFIA. Follow up actions may involve a food safety investigation, including a health risk assessment conducted by Health Canada and a recall or one of the following: notification to manufacturer/importer and/or additional sampling.

What is food safety oversight

FSO is primarily used by the CFIA to fill in data gaps in regulatory monitoring programs for non-meat commodities such as fish, bakery products, processed and fresh fruit and vegetables. Additionally, the program is used to verify compliance with Canadian regulations for chemical residues, allergens and contaminants and to identify trends and to determine the effectiveness of policies and programs.

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

Approximately 7% of Canadians have self-reported as having at least 1 food allergy, but the actual number of medically diagnosed food allergies is expected to be slightly lower[1]. It is believed that the rate of food allergies is increasing, particularly among children. Food allergies are estimated to affect up to 5% of adults and up to 8% of children in developed countries[2]. Food allergens are food proteins that can cause a reaction of the body's immune system, and can represent a serious or life threatening health risk for allergic individuals or contribute to chronic health issues for those with pre-existing health conditions like celiac disease.

The priority food allergens are the 10 most common food components that are associated with severe allergic or allergy-like reactions in Canada. These allergens consist of peanuts, tree nuts, sesame, seafood (fish, shellfish and crustaceans), eggs, milk, soy, mustard, sulphites, and wheat[3].

Sulphites are sulphur-based substances used as preservatives to increase shelf-life, prevent the growth of micro-organisms and to maintain food colour[4,5,6]. They are used to bleach food starches such as potato and are used in the production of some food packaging materials (such as cellophane)[4]. For the majority of consumers, eating products treated with sulphites is safe[4]. However, sulphite-sensitive consumers may have symptoms such as nausea, abdominal pain, diarrhea, seizures and in extremely rare cases, anaphylactic shock[4,5,6]. Canadian regulations do not allow sulphiting agents to be used on any fruit or vegetable that is intended to be consumed raw, except grapes.

Sulphites can be present in foods such as beer and cider, dried fruits and vegetables, grapes, fruit and vegetable juices, starches, wine, vinegar, tomato products, imported fresh fruits, cereal and teas[4]. This monitoring plan provided information on the levels found in food products that are available in Canada.

What did we sample

A variety of imported fresh fruit such as longans, lychee, tamarind, durian, mangos, papayas, cherimoya, pineapple, rambutan and melons were sampled between April 1, 2015 to March 31, 2019. Fresh cut fruit, fresh cut fruit mixes (for example, fruit salad) and canned or pre-packaged fruit (such as fruit cocktails) were sampled between April 1, 2016 to March 31, 2018. Samples of products were collected from local/regional retail locations across 6 major cities across Canada.These cities encompassed 4 Canadian geographical areas: Atlantic (Halifax and Saint John), Quebec (Quebec City and Montreal), Ontario (Toronto and Ottawa) and the West (Vancouver, Kelowna, Saskatoon, Winnipeg 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 and Table 2 for the product types collected in this survey.

Table 1. Distribution of samples for imported fresh fruit.

Product type	Number of imported samples
Apricot	27
Asian Pear	124
Atemoya	1
Banana	3
Cherimoya	42
Dates	40
Dragon fruit	90
Durian	46
Fig	47
Guava	32
Kiwi	3
Longan	77
Lychee	55
Mango	121
Mangosteen	1
Nectarine	1
Papaya	97
Passion fruit	27
Persimmon	85
Pineapple	46
Pomegranate	1
Pomelo	27
Rambutan	69
Raspberries	1
Star Fruit	58
Tamarind	56
Total	**1177**

Table 2. Distribution of samples based on product type and origin for canned/pre-packaged fruit and fresh cut fruit/fruit mixes.

Product type	Number of imported canned/pre-packaged samples	Number of domestic fresh samples	Number of imported fresh samples	Number of fresh samples of unspecified origin[a]	Total number of samples
Apple	0	10	30	13	53
Apricots	2	0	0	0	2
Banana	2	0	0	0	2
Cantaloupe	0	0	8	12	20
Coconut	0	0	2	0	2
Honeydew	0	0	4	4	8
Jackfruit	3	0	1	0	4
Kiwi	0	0	1	0	1
Longan	4	0	0	0	4
Lychee	3	0	0	0	3
Mandarin oranges	8	0	0	0	8
Mango	7	0	37	3	47
Mangosteen	1	0	0	0	1
Mixed fruit[b]	45	0	15	33	93
Papaya	4	0	1	1	6
Peach	103	0	0	0	103
Pear	52	0	0	0	52
Pineapple	57	0	84	11	152
Plum	1	0	0	0	1
Pomelo	1	0	0	0	1
Rambutan	1	0	0	0	1
Strawberries	0	0	0	2	2
Watermelon	1	0	20	6	27
Grand total	**295**	**10**	**203**	**85**	**593**

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

[b] Mixed fruit refers to 2 different types of fruit or more in 1 sample

How were samples analyzed and assessed

Samples were analyzed by an ISO/IEC 17025 accredited CFIA laboratory. The rind/peel and the flesh of imported whole fruit were tested separately for sulphites. The samples were analysed separately since the presence of sulphites on the rind indicates that the fruit was treated with sulphites and the presence of sulphites in the flesh provided information on the concentration that was transferred to the edible portion.

Fresh cut fruit/fruit mixes and canned/pre-packaged fruit samples were tested as sold which means that the product was tested as is and not prepared according to package instructions.

Canadian regulations do not allow the use of sulphites on any fruit or vegetable that is intended to be consumed raw, except grapes. According to the *Food and Drug Regulations*, section B.01.010.2 (3), if sulphites are present in a total amount of 10 ppm or more and is not listed on the list of ingredients this is considered unsatisfactory. Results of 10 ppm and below are not considered to be reliable and are considered satisfactory. Results above 10 ppm are followed up by the CFIA. Follow up actions may involve a food safety investigation, including a health risk assessment conducted by Health Canada, a recall, a notification to the manufacturer/importer and/or additional sampling.

What were the survey results

All 593 samples (100%) of fresh cut fruit/fruit mixes and canned/pre-packaged fruit were satisfactory with no sulphites detected.

Out of 1177 imported fresh fruit samples, 1090 (92.6%) were satisfactory. Sulphite positives were found in cherimoya, longan, lychee and tamarind samples. Overall, 87 (7.4%) samples were unsatisfactory. All fruit samples that were positive in the flesh were also positive in the rind. Concentrations in the flesh were lower than the rind of the fruit. The majority of samples tested for sulphites were satisfactory. See Table 3 and Table 4 for positive sample results.

Table 3. Number of positive samples in imported fresh fruit.

Product type	Number of samples	Number of positive samples (%)	Number of positives for flesh	Number of positives for rind
Cherimoya	42	1 (2.4)	0	1
Longan	77	43 (55.8)	6	43
Lychee	55	41 (74.5)	4	41
Tamarind	55	2 (3.6)	0	2
Total	229	87	10	87

Note: Samples that were positive for flesh were also positive for rind.

Table 4. Levels of sulphites in positive imported fresh fruit.

Product type	Minimum flesh (ppm)	Maximum flesh (ppm)	Average flesh (ppm)[a]	Minimum rind (ppm)	Maximum rind (ppm)	Average rind (ppm)[c]
Cherimoya	0	0	0	0	15	15
Longan	0	280	75	0	1400	689
Lychee	0	99	38.8	0	500	161.3
Tamarind	0	0	0	0	21	18.5

[c]Only positive results were used to calculate average sulphite levels.

What do the survey results mean

Table 5. Minimum, maximum and average concentration of sulphites in imported fresh fruit across various years

Product type	Rind or flesh	Year	Number of samples	Number of samples (%) with detected levels	Minimum (ppb)	Maximum (ppb)	Average (ppb)
Cherimoya	Rind	2015 to 2019[d]	42	1 (2.4)	0	15	15
	Rind	CFIA 2012 to 2013	48	19 (40)	0	59.2	26.5
	Flesh			2 (4)	0	18.9	15.6
Longan	Rind	2015 to 2019	77	43 (56)	0	1400	689
	Flesh			6 (7.8)	0	280	75
	Rind	CFIA 2012 to 2013	76	76 (100)	290	1330	941
	Flesh			12 (16)	0	201	39.8
Lychee	Rind	2015 to 2019	55	41 (75)	0	500	161
	Flesh			4 (7.3)	0	99	38.8
	Rind	CFIA 2012 to 2013	39	34 (87)	0	314	132
	Flesh			2 (5)	0	62.5	37.5
Tamarind	Rind	2015 to 2019[d]	20	1 (5)	0	21	21
Rambutan	Rind	2015 to 2019[d]	69	0 (0)	0	0	0
	Rind	CFIA 2012 to 2013[d]	56	19 (34)	0	1260	82.9

[d] Flesh was tested and had no detected levels of sulphites.

In comparison to a CFIA 2012 to 2013 survey of sulphites in imported fruits, there is a decrease in the number of positive samples. In the 2012 survey, 68% (148 out of 219 samples) were positive for sulphites whereas 7.4% (87 out of 1177 samples) of samples were positive for 2015 to 2019. Positive cherimoya samples decreased from 40% to 2.4%, positive longan samples decreased from 100% to 56%, positive lychee samples decreased from 87% to 75% and positive rambutan samples decreased from 34% to 0%. There was no previous data for sulphites in tamarind for comparison, however only 1 out of 20 samples was positive.

Consistent with the 2012 survey, sulphites in the fruit's flesh were lower in concentration in comparison to the rind and samples with positive results in the flesh also had positive results in the rind.

There is no historical data to compare fresh cut fruit/fruit mixes and canned/pre-packaged fruit results. However, all results from these samples were satisfactory.

All positive results were followed up by the CFIA which may involve a food safety investigation, including a health risk assessment conducted by Health Canada, a recall, a notification to the manufacturer/importer and/or additional sampling.

References

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