Canadian Food Inspection Agency
Agence canadienne d'inspection des aliments

Parasites in imported leafy vegetables - April 1, 2020, to March 31, 2025

Food microbiology - Targeted surveys - Final report

Food microbiology targeted surveys – January 2026

Canada

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Summary

A targeted survey[1] analysed 1984 samples of imported vegetables over a 5-year period from April 1, 2020, to March 31, 2025. The samples consisted of fresh-cut vegetable salads, and trimmed, single-cut or whole leafy vegetables. Of the 1984 samples, 1310 (66.0%) were tested for the presence of both *Cyclospora cayetanensis* (*C. cayetanensis*) and *Giardia* spp., while 664 (33.5%) were tested for the presence of *C. cayetanensis* only and 10 (0.5%) were tested for the presence of *Giardia* spp. only.

Of the 1984 samples tested, 99.6% of the samples were found to be satisfactory. *C. cayetanensis* was found in 5 of the 1974 (0.3%) samples tested. *Giardia* spp. was found in 3 of the 1320 (0.2%) samples tested. The Canadian Food Inspection Agency (CFIA) conducted appropriate follow-up activities. There were no reported illnesses related to these products.

Overall, our survey results indicate that imported vegetables sold in Canada are generally safe for consumption, however they can occasionally be contaminated. Consequently, as with all foods, and especially with those that are consumed raw, good hygienic practices are recommended for producers, retailers, and consumers.

Why the survey was conducted

The survey, which started in 2014, was conducted to provide enhanced oversight of the safety of imported fresh vegetables sold at retail in Canada. This report includes survey results from April 1, 2020, to March 31, 2024. Survey results from previous years are available[2,3,4,5].

While fresh vegetables are popular among Canadians[6], they have unfortunately been associated with recalls[7] and foodborne illness outbreaks[8,9]. Fresh produce, including vegetables can be contaminated with parasites through contact with human and animal waste at any step in the food supply chain such as during production, harvest, post-harvest handling, packaging, distribution, and/or at retail. Unlike bacteria, parasites are unable to grow on foods, however they can remain viable for extended periods of time and may cause illness when ingested. Therefore, the presence of parasites on fresh vegetables is of concern as they are a commonly consumed by Canadians and are generally consumed raw.

When the survey was conducted

The survey is ongoing, however the results reported herein are for samples collected over a 5-year period from April 1, 2020, to March 31, 2025.

Where the samples were collected from

Samples were collected from national retail chains and local/regional grocery stores located in the following 11 major cities across Canada:

- Halifax
- Moncton or Saint John
- Quebec City
- Montreal
- Toronto
- Ottawa
- Vancouver
- Victoria or Kelowna
- Calgary
- Saskatoon
- Winnipeg

The planned number of samples to be collected from each city was based on the population of the province in which the city was located relative to the total population of Canada.

Total number and description of samples collected

A total of 1984 imported fresh vegetables were collected. Throughout the 5-year survey period, the scope of sampling included:

- pre-packaged fresh-cut vegetable salad kits (romaine lettuce-based salads, coleslaws, salad blends composed of leafy and non-leafy vegetables)
- pre-packaged trimmed leafy vegetables (baby leafy vegetables, spinach, kale)
- pre-packaged single-cut leafy vegetables (romaine lettuce leaves, green leaf lettuce leaves, kale leaves)
- pre-packaged or bulk whole leafy vegetables (spinach, green leaf lettuce, radicchio)

A sample consisted of a single or multiple consumer sized packages of the same lot weighing at least 250 g.

What the samples were tested for

Of the 1984 samples, 1310 (66.0%) were tested for the presence of both *C. cayetanensis* and *Giardia* spp., while 664 (33.5%) were tested for the presence of *C. cayetanensis* only and 10 (0.5%) were tested for the presence of *Giardia* spp. only.

Methods used to test the samples

Samples were analyzed using methods that detect the presence of deoxyribonucleic acid (DNA) of *C. cayentanensis,* and *Giardia* spp.

How samples were assessed

There are currently no Canadian standards regarding the presence of parasites in fresh produce. As the analytical methods used in this survey can only determine the presence or absence of parasite DNA, they cannot discriminate between living (infectious) and dead (non-infectious) parasites. Therefore, the detection of parasite DNA was assessed as "investigative" (Table 1) and required further consideration to determine appropriate follow-up actions.

Table 1 - Assessment criteria

Parasite	Satisfactory	Investigative
C. cayetanensis	Not detected	Detected
Giardia spp.	Not detected	Detected

Survey results

C. cayentanensis DNA was found in 5 of the 1974 (0.3%) samples. *Giardia* spp. DNA was found in 3 of the 1320 (0.2%) samples.

Table 2 – Analysis assessment results

Parasite	Number of samples tested	Satisfactory	Investigative (%)
C. cayetanensis	1973	1968	5 (0.3)
Giardia spp	1320	1317	3 (0.2)

Survey results are also presented by production practice (table 3), country of origin (table 4), product and packaging type (table 5), and season sampled (table 6). Further details about each investigative sample are provided in table 7.

Table 3 - Assessment results by production practice

Production practice	Number of samples tested (%)	Satisfactory	Investigative
Conventional	1764 (88.9)	1756	8
Organic	220 (11.1)	220	0
Total (%)	**1984 (100.0)**	**1976 (99.6)**	**8 (0.4)**

Table 4 - Assessment results by country of origin

Country of origin	Number of samples tested (%)	Satisfactory	Investigative
Belgium	19 (1.0)	19	0
Guatemala	1 (0.1)	1	0
Italy	1 (0.1)	1	0
Mexico	127 (6.4)	126	1
Morocco	1 (0.1)	1	0
Netherlands	20 (1.0)	20	0
United States	1701 (85.7)	1695	6
United States, Canada	1 (0.1)	1	0
United States, Guatemala	1 (0.1)	1	0
United States, Mexico	109 (5.5)	108	1
United States, Mexico, Canada	1 (0.1)	1	0
United States, Mexico, Guatemala	1 (0.1)	1	0
Unknown[a]	1 (0.1)	1	0
Total (%)	**1984 (100%)**	**1976 (99.6)**	**8 (0.4)**

Table 5 - Assessment results by vegetable product and packaging type

Product type	Packaging type	Number of samples tested (%)	Satisfactory	Investigative (%)
Fresh-cut	Pre-packaged	1176 (59.3)	1174	3
Single-cut	Pre-packaged	15 (0.8)	15	0
Trimmed	Pre-packaged	121 (6.1)	119	1
Whole	Bulk	602 (30.3)	598	4
Whole	Pre-packaged	70 (3.5)	70	0
Total (%)	**Not applicable**	**1984 (100)**	**1976 (99.6)**	**8 (0.4)**

Table 6 - Assessment results by season sampled

Season	Number of samples tested (%)	Satisfactory	Investigative (%)
Spring (March to May)	385 (19.4)	384	1
Summer (June to August)	407 (20.5)	405	2
Fall (September to November)	623 (31.4)	622	1
Winter (December to February)	569 (28.7)	565	4
Total (%)	**1984 (100)**	**1976 (99.6)**	**8 (0.4)**

[a] Country of origin could not be assigned from the product label, or available sample information.

Table 7 - Detailed information about investigative samples

Fiscal year	Parasite[b] detected	Product type	Packaging type	Country of origin	Season sampled	Production practice
2020-2021	*C. cayetanensis*	Trimmed baby spinach	Pre-packaged	United States	Fall	Conventional
2020-2021	*Giardia* spp.	Fresh-cut Italian salad	Pre-packaged	United States	Winter	Conventional
2021-2022	*C. cayetanensis*	Whole radicchio	Bulk	United States	Winter	Conventional
2021-2022	*C. cayetanensis*	Whole romaine lettuce	Bulk	United States	Winter	Conventional
2022-2023	*C. cayetanensis*	Whole radicchio	Bulk	United States	Summer	Conventional
2022-2023	*C. cayetanensis*	Fresh-cut kale salad kit	Pre-packaged	United States	Summer	Conventional
2022-2023	*Giardia* spp.	Fresh-cut Italian salad	Pre-packaged	United States, Mexico	Winter	Conventional
2023-2024	*Giardia* spp.	Whole kale	Bulk	Mexico	Spring	Conventional

What the survey results mean

Previous Canadian[2,4,5,5] studies on the microbial safety of pre-packaged, imported retail fresh vegetables have shown results approximating those found in this study.

Overall, our survey results indicate that imported fresh vegetables sold in Canada are generally safe for consumption, however they can occasionally be contaminated. Consequently, as with all foods, and especially with those that are consumed raw, good hygienic practices are recommended for producers, retailers, and consumers.

[b] DNA detected

What is done with the survey results

All results are used to:

- inform risk management decisions
- support program design and re-design

While no illnesses were related to the investigative samples, these results triggered appropriate follow-up actions including:

- follow-up with the retailer
- follow-up with other provincial and federal government departments
- follow-up with foreign competent authorities

Where to access the survey data

The data will be accessible on the Open Government Portal.

References

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