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

Food colours in selected foods – April 1, 2023 to March 31, 2024

Food chemistry – Targeted surveys – Final report

Canada

Catalogue No.: A104-657/2024E-PDF
ISBN: 978-0-660-77621-7
Aussi disponible en français.

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 agency 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.

Food colours are routinely added to foods and beverages for a variety of reasons, including to compensate for the loss of natural colour caused by processing conditions, and to meet consumer expectations by making the food more appealing and appetizing by enhancing the colour or making it more uniform. Targeted surveys focusing on colouring agents have been initiated in part due to potential health concerns associated with uses of non-permitted colouring agents in processed foods. The presence of non-permitted colouring agents may pose a health risk to the consumer, as some are potentially damaging to DNA and carcinogenic[1,2]. Undeclared use of permitted synthetic colouring agents may also be a potential concern to a small percentage of the population which has exhibited sensitivity to synthetic colouring agents, resulting in skin rashes and triggering asthmatic reactions in individuals with asthma[3,4].

Targeted surveys focussed on food colours have been carried out previously. The primary focus of this survey was to examine brightly coloured products potentially containing added colours. A total of 394 samples of frozen desserts, spices, sweets, and vegetable products were collected and tested for up to 43 different food colours. Food colours were detected in 115 (29%) of the samples tested. Overall 14 samples were non-compliant; non-permitted food colours were detected in 7 of these samples, 6 samples were missing a declaration of food colours on the label, and food colours at levels exceeding the maximum level of use were detected in 3 samples. When compared to previous survey years, this year's survey results show a similar compliance rate (96.5%).

The levels of food colours observed in this survey were evaluated by Health Canada's Bureau of Chemical Safety who determined that none of the samples tested would pose an unacceptable human health concern. The extent of the follow up actions taken by the agency was based on the level of the contamination and the resulting health concern.

What targeted surveys are

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 our 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. We work with federal, provincial, territorial and municipal governments and provide 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 the survey was conducted

Food colours, both naturally-sourced and synthetically manufactured, are widely used by the food industry. They are incorporated into processed foods for a variety of reasons including: to compensate for the natural colour(s) lost during processing; to achieve a uniform product colour; and to make the food appear more appealing and appetizing.

In Canada, food colours are considered food additives and are regulated under Marketing Authorizations issued by the Minister of Health. Health Canada conducts detailed, rigorous, safety-focused pre-market evaluations of food additives prior to allowing their use in foods and setting the maximum allowable levels of use of those colours[5,6]. It should be noted that coloured impurities other than the main colour (called subsidiary colours) are not regulated within food products, but are regulated as part of the food colour raw material source. In Canada, 10 synthetic colours have been approved for use in food, and are listed in the *Food and Drug Regulations* (FDR)[6] and summarized in Appendix A. The presence of 1 or more approved colours in food is not unexpected. In 2018, Health Canada amended the food colour labelling requirements that require colouring agents to be identified on labels by their common name in order to make more information available to consumers when making food selections[7].

The presence of non-permitted food colours, particularly industrial dyes, may pose a health risk to the consumer, as some are potentially damaging to DNA and carcinogenic[1,2]. Undeclared use of permitted synthetic colouring agents may also be a potential concern to a small percentage of the population which has exhibited sensitivity to synthetic colouring agents, resulting in skin rashes and triggering asthmatic reactions in individuals with asthma[3,4]. Furthermore, several studies have suggested a correlation between consumption of certain synthetic food colours and hyperactive behaviour in children, although this relationship has not been conclusively

proven[8,9]. Despite the lack of a clear link, anecdotal information suggests that certain consumers are cautious about the use of synthetic food colour additives, primarily for health and safety reasons. With trends toward healthier lifestyles, the food industry is noting that consumers are demanding fewer artificial or synthetic ingredients in foods[10]. Targeted surveys focussed on food colours have been carried out previously. The primary focus of this survey was examination of brightly coloured products potentially containing added colours.

What we sampled

A variety of domestic and imported frozen desserts (dairy and non-dairy), spices (cinnamon, curry, cumin, masala, peppers/paprika, turmeric, etc.), sweets (soft and hard candy, fruit leathers and snacks) and vegetable products (pickled beets, cucumbers, onions, peppers, etc.) were sampled between April 1, 2023 and March 31, 2024. 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)
- West (Vancouver and Calgary)

The number of samples collected from these cities was in proportion to the relative population of the respective areas.

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[a] origin	Total number of samples
Frozen desserts	50	15	30	95
Spices	11	61	29	101
Sweets	21	75	26	122
Vegetable products	10	58	8	76
Total	**92**	**209**	**93**	**394**

Table notes

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

How samples were analyzed and assessed

Samples were analyzed by an ISO/IEC 17025 accredited food testing laboratory under contract with the Government of Canada. Based on the nature of the food product, samples were analyzed for water-soluble, oil-dispersible colours, or both. See Appendix A for a list of the colours analyzed. The results represent finished food products as sold and not as they would be consumed, whether the product sampled is considered an ingredient or requires preparation prior to consumption.

The results obtained from the analysis of the products were assessed against the regulations on permitted colouring agents established by Health Canada[11].

Results of the survey

Of the 394 food samples tested, food colours were detected in 115 (29%) samples. Most of these samples (99%) contained between 1 and 4 colours, and up to 5 colours were detected in one sample for a total of 271 positive results. Table 2 summarizes the food colours detected and their prevalence in each product type. Sweets had the highest percentage of samples containing added food colours at 60%.

Overall 14 samples were non-compliant; non-permitted food colours were detected in 7 of these samples, 6 samples were missing a declaration of food colours on the label, and food colours at levels exceeding the maximum level of use were detected in 3 samples. As shown in Table 3, the most commonly detected food colours in the survey were Allura Red, Tartrazine and Brilliant Blue FCF. These accounted for 73% of positive results and were the most commonly detected colours in all survey years.

Table 2. Summary of food colour testing

Product type	Number of samples	Number of samples with food colours detected (%)	Number of times food colours were detected	Number of non-compliant samples (number of non-compliant results)
Frozen desserts	95	18 (19)	47	2 (4)
Spices	101	7 (7)	13	7 (14)
Sweets	122	73 (60)	192	1 (1)
Vegetable products	76	17 (22)	19	4 (6)
Total	**394**	**115 (29)**	**271**	**14 (25)**

Table 3. Food colours detected and the number of samples in which the colour was detected

Colouring agent detected in survey samples (permitted colours in bold)	Number of samples in which colour was detected	Minimum (ppm)	Maximum (ppm)	Average[b] (ppm)
Allura Red	79	1.08	201	51
Amaranth	3	37.9	1930	1275
Auramine O	2	0.211	0.273	0.242
Brilliant Blue FCF	59	0.711	84.3	10
Chrysoidine G	2	0.11	0.139	0.125
Erythrosin B	19	4.7	347	40
Indigo Carmine	3	6.55	11	8.6
Orange II	3	1.01	2680	641
Rhodamine B	1	4.59	5.4	5.0
Sudan I	1	3.39	3.39	3.4
Sunset Yellow FCF	39	1.32	12400	644
Tartrazine	60	2.28	108	29

Table notes

ppm = parts per million.
[b] Only positive results were used to calculate the average food colour levels.

What the survey results mean

The main objectives of this targeted survey were to expand upon baseline data regarding the levels of permitted food colours in selected foods on the Canadian retail market. Out of a total of 394 samples tested, 380 (96.5%) samples were in compliance with Canadian standards and limits. Table 4 compares this survey results with five years of past survey data for food colours.

Despite some disparity in products sampled across the surveys years, the compliance rate was similar to previous survey years[12,13,14,15,16]. In general, the same types of non-compliant results found in the current survey were found in previous surveys in similar product types. The detection rates are in close agreement with the results of previous surveys when compared with similar commodities. It should be re-iterated that samples were selected due to their high likelihood of containing food colouring agents, and that prevalence in the food categories selected are not necessarily representative of the prevalence of synthetic food colours in all foodstuffs available at retail.

Table 4. Food colours results from various CFIA survey years

Survey year	Number of samples	Detection rate (%)	Compliance rate (%)	Number of non-compliant samples (number of non-compliant results)
2023	394	29	96.5	14 (25)
2022	190	31	96.8	6 (11)
2021	192	32	94.8	10 (10)
2020	391	33	95.1	19 (23)
2019	398	0.5	99.7	1 (2)
2018	399	45	98.7	5 (5)

The levels of food colours observed in this survey were evaluated by Health Canada's Bureau of Chemical Safety who determined that none of the samples tested would pose an unacceptable human health concern. The extent of the follow up actions taken by the agency was based on the level of the contamination and the resulting health concern.

References

1. Opinion of the Scientific Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food on a request from the Commission to Review the toxicology of a number of dyes illegally present in food in the EU. (2005). European Food Safety Authority. EFSA Journal 263, pp. 1-71.
2. Agents Classified by the IARC Monographs, Volumes 1-123. (2019). International Agency for Research on Cancer.
3. Lockey, S.D. Sr. (1977). Hypersensitivity to tartrazine (FD&C Yellow No. 5) and other dyes and additives present in foods and pharmaceutical products. Ann Allergy. March 38 (3), pp. 206-210.
4. David, T.J. (1988). Food Additives. Archives of Disease in Childhood. 63, pp. 582-583
5. Food Additives. (2012). Canada. Health Canada.
6. Lists of Permitted Food Additives. (2021). Canada. Health Canada.
7. Notice to industry: Implementation of the 2016 nutrition labelling amendments. (2018). Canada. Canadian Food Inspection Agency.
8. McCann, D., Barrett, A., Cooper, A., Crumpler, D., Dalen, L., Grimshaw, K., Kitchin, E., Lok, K., Porteous, L., Prince, E., Sonuga-Barke, E., Warner, J.O., Stevenson, J. (2007). Food additives and hyperactive behaviour in 3-year-old and 8/9-year-old children in the community: a randomised, double-blinded, placebo-controlled trial. The Lancet. Volume 370 (9598), pp.1560-1567.
9. FAQ on food colours. European Food Safety Authority.
10. Making Our Products Tastier & Better For You. (2023). Nestlé Canada.
11. Lists of Permitted Food Additives. 3. List of Permitted Colouring Agents (Lists of Permitted Food Additives). (2017). Canada. Health Canada.
12. 2018 to 2019 Food Colours in essences/flavourings, oils, sweets and processed vegetables. (2021). Canada. Canadian Food Inspection Agency.
13. 2019 to 2020 Food Colours in Fish, Seafood, Meat and Meat Alternatives. (2022). Canada. Canadian Food Inspection Agency.
14. 2020 to 2021 Food Colours in Selected Foods. (2022). Canada. Canadian Food Inspection Agency.
15. 2021 to 2022 Food Colours in Selected Foods. (2023). Canada. Canadian Food Inspection Agency.
16. 2022 to 2023 Food Colours in Selected Foods. (2023). Canada. Canadian Food Inspection Agency.

Appendix A

List of colours tested by the accredited laboratory in this survey (permitted colours in bold)

Water-soluble colours	**Tartrazine**
	Amaranth
	Indigo Carmine (Indigotine)
	Sunset Yellow FCF
	Allura Red
	Ponceau SX
	Fast Green FCF
	Brillant Blue FCF
	Erythrosin B
	Chlorophyllin
	Ponceau 4R (New Coccine) †
	Fast Red E†
	Bordeaux R†
	Erythrosin Yellowish (2,4,5- triiodofluorescein) †
	4,5-diiodofluorescein†
	Crocein Orange G†
	Orange II†
	2,4,7-triiodofluorescein†
	Orange GGN
	Azorubine (Carmoisine)
	Lissamine Green
	Quinoline Yellow 1
	Eosin Y
	Patent Blue VF
	Patent Blue Violet Calcium
	Chrysoidine G
	Rhodamine B
Fat-soluble colours	Sudan I
	Sudan II
	Sudan III
	Sudan IV
	Sudan Red B
	Sudan Red 7B
	Sudan Red G
	Sudan Orange G
	Sudan Blue II
	Solvent Blue 59
	Toluidine Red
	Para Red
	Methyl Yellow
	Metanil Yellow *
	Orange II *
	Rhodamine B *
	Sudan Black B
	Citrus Red 2

Table notes

†May be present as a subsidiary food colour.
*Water-soluble fat-soluble colours.