



Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments

Food Colours in Selected Foods - April 1, 2021 to March 31, 2022

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 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 examination of brightly coloured products potentially containing added colours, and ensuring compliance of products marketed as natural products not containing synthetic food colours. A total of 192 samples of bakery products, beverages, dried mixes, natural foods, sweets and vegan products were collected and tested for up to 43 different food colours. Food colours were detected in 61 (32%) of the samples tested. When compared to previous survey years, this year's survey results show a similar detection rate and a slightly lower compliance rate (94.8%), since the samples were selected due to their high likelihood of containing food colouring agents. Food colours at levels exceeding the maximum level of use were detected in 10 samples.

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 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 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 did we conduct this survey

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. Industry may follow the former requirements during the 5 year transition period⁷.

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 foods¹⁰.

Targeted surveys focussed on food colours have been carried out previously. Based on the results of the previous food colours survey, and after consultation with Health Canada, examination of specific food colour additives was considered a high priority. The primary focus of this survey was examination of brightly coloured products potentially containing added colours, and ensuring compliance of products marketed as natural products not containing synthetic food colours. Based on the results of the previous food colours survey, and after consultation with Health Canada, examination of specific food colour additives was also considered a priority. Red/fuchsia products likely to contain Allura Red and Amaranth food colours were included in this survey.

What did we sample

A variety of domestic and imported bakery products (cookies, cupcakes, etc.), beverages (flavoured water), dried mixes (cake and cupcake baking mixes), natural food (products marketed as natural products not containing artificial colours), sweets (soft and hard candy, fruit leathers and snacks) and vegan products (meat/fish/dairy alternatives) were sampled between April 1, 2021 and March 31, 2022. 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
Bakery products	5	4	7	16
Beverages	4	9	7	20
Dried mixes	0	14	11	25
Natural foods	1	13	6	20
Sweets	6	23	15	44
Vegan products	34	16	17	67
Total	50	79	63	192

^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 were samples 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 coloring agents established by Health Canada¹¹.

What were the survey results

Of the 192 food samples tested, food colours were detected in 61 (32%) samples. More than half of these samples (32/61) contained only one food colour and up to 4 colours were detected in the rest of the positive samples for a total of 117 positive results. Table 2 summarizes the food colours detected and their prevalence in each product type. Dried mixes had the highest percentage of samples containing added food colours at 72%, followed by bakery products (69%). Synthetic food colours were not detected any of the vegan products and products marketed as natural products not containing synthetic colours. The highest levels of food colours were associated with baking mixes.

Overall, 10 samples were non-compliant with Canadian food regulations. All 10 of these samples (4 products; 6 unique lot numbers) contained food colours at levels exceeding the maximum level of use. Of these samples, 8 samples were baking mixes, 1 was a sample of fruit flavoured candy (roll ups) and 1 was a sample of imported cookies. None of the products tested this survey year contained non-permitted food colours or permitted food colours without a declaration of use in the list of ingredients.

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 72% of positive results. They were the most commonly detected colours in all survey years. Since this survey focused partially on examination of brightly coloured red/fuchsia products, the detection rates of colouring agents used to generate other food colours were usually lower.

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)
Bakery products	16	11 (69)	18	1 (1)
Beverages	20	8 (40)	8	0
Dried mixes	25	16 (72)	16	8 (8)
Natural foods	20	0	0	0
Sweets	44	26 (22)	75	1 (1)
Vegan products	67	0	0	0
Total	192	61 (32)	117	10 (10)

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	47	11.4	656	144
Amaranth	1	2.42	2.42	2.42
Brilliant Blue FCF	25	1.4	192	26.5
Erythrosin B	14	6.5	117	64.5
Indigo Carmine	2	10.4	11.7	11.1
Sunset Yellow FCF	6	4.49	41.2	17.4
Tartrazine	22	1.75	108	39.6

ppm = parts per million

^b Only positive results were used to calculate the average food colour levels

What do the survey results mean

The main objectives of this targeted survey were to expand upon baseline data regarding the levels of permitted synthetic food colours in selected foods on the Canadian retail market. Out of a total of 192 samples tested, 182 (94.8%) 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.

When compared to previous survey years, this year's survey results show a slightly lower compliance rate due to the focus on different commodities^{12,13,14,15,16,17}. 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 survey years

Survey year	Number of samples	Detection rate (%)	Compliance rate (%)	Number of non-compliant samples (number of non-compliant results)
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)
2014	980	15	98.9	11 (25)
2013	875	33	97.8	19 (22)

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

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16. [2019-2020 Food Colours in Fish, Seafood, Meat and Meat Alternatives.](#) (2022). Canada. Canadian Food Inspection Agency.
17. [2020-2021 Food Colours in Selected Foods.](#) (2022). 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
	Brilliant 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	

†May be present as a subsidiary food colour

*Water-soluble fat-soluble colours