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

Food Colours in Beverages, Condiments, Soups, Pickled Vegetables, Dried Spices and Mixes, and Oils - April 1, 2014 to March 31, 2015

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].

This targeted survey generated further baseline surveillance data on the occurrence of food colours in domestic and imported products on the Canadian market. A total of 980 samples were tested for up to 43 different food colour additives. Food colours were not detected in 834 (85%) of the samples tested. When compared to previous survey years, these results show a similar detection rate and compliance (98.9%) rate. Almost all violations (11) were attributed to a missing or incorrect declaration of colour being made on the product label. In addition, 2 of these non-compliant samples (spice mixes) contained non-permitted colours. Only 1 sample contained a food colour above the maximum level.

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 would pose an unacceptable human health concern, therefore there were no recalls resulting from this survey.

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, ten synthetic colours have been approved for use in food, and are listed in the *Food and Drug Regulations* (FDR). The presence of 1 or more approved colours in food is not unexpected. Declaration of individual colours by the manufacturers was voluntary when the survey was carried out. However, Health Canada recently 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 focused on colouring agents have been carried out previously and will continue to generate further baseline data.

What did we sample

A variety of domestic and imported beverages, condiments, soups, pickled vegetables, dried spices and spice mixes, and oils were sampled between April 1, 2014 and March 31, 2015. 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, 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.

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	Total number of samples
Beverages	0	174	76	250
Condiments, soups and pickled vegetables	3	178	16	197
Dry spices and mixes	1	156	91	248
Oil	10	213	62	285
Grand total	**14**	**721**	**245**	**980**

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

What analytical methods were used and how were samples assessed

Samples were analyzed by an ISO 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 colours, 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.

What were the survey results

Of the 980 food samples tested, food colours were not detected in 834 (85%) of the samples. Most of these samples (89%) contained between 1 and 4 colours but some samples contained 5 added colours. There were no food colors detected in the oil samples tested. Table 2 summarizes food colours detected and their prevalence in each product type. Beverages had the highest percentage of samples containing 1 or more food colours at 44%, followed by dried spices and mixes (9%), and condiments, soups and pickled vegetables (8%). The highest food colour levels were associated with dried spices and mixes. Overall, 11 samples were non-compliant with the Canadian food regulations. Most of these samples had missing or incorrect declaration of a permitted food colour being made on the product label (9 samples). Only 1 sample contained a food colour above the maximum level. Non- permitted food colours were only found in 2 samples.

As shown in Table 3, the most commonly detected food colours in the survey were Allura Red, Brilliant Blue FCF, Tartrazine and Sunset Yellow FCF. These accounted for 90% of positive results. They were the most commonly detected in all survey years. All food colours detected were water-soluble.

Table 2. Summary of food colour testing in selected foods

Commodity	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 residue results)
Beverages	250	110 (44%)	177	4 (7)
Condiments, soups and pickled vegetables	197	16 (8%)	27	2 (3)
Dried spices and mixes	248	22 (9%)	47	5 (15)
Oils	285	0	0	0
Grand total	**980**	**146 (15%)**	**251**	**11 (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 †	Maximum level detected (ppm)	Average level detected (ppm)
Allura Red	61	1665.7	68.1
Brilliant Blue FCF	56	82.1	4.6
Tartrazine	56	6476.7	135.2
Sunset Yellow FCF	53	2727.9	71.4
Amaranth	10	38.5	31.2
Fast Red E*	4	<LQ=0.49	<LQ
Azorubine	2	11.6	9.9
Erythrosin B	2	40.6	21.3
Indigo Carmine	2	7.7	7.2
Ponceau 4R (New Coccine)*	2	306.7	257.6
2,4,5 and/or 2,4,7-triiodofluorescein*	2	<LQ=0.529	<LQ

†Samples may contain more than one food colour

*May be present as a subsidiary food colour

<LQ = Below the limit of quantification (above limit of detection)

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 and to obtain information regarding the presence of non-permitted food colours in a variety of foods. Out of a total of 980 samples tested, 969 (98.9%) samples were in compliance with the Canadian standards and limits. Table 4 summarizes the five years of targeted survey data for food colours. Despite some disparity in products sampled across the surveys years, the

compliance rate in 2014 to 2015 was similar to previous survey years[11,12,13,14,15]. In general, the same types of non-compliant residue results found in the current survey were found in previous surveys. The detection rates are in close agreement with the results of previous surveys when compared with similar products tested. 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 residue results)
2014 to 2015	980	15	98.9	11 (25)
2013 to 2014[15]	875	33	97.8	19 (22)
2012 to 2013[14]	1493	58	97.6	36 (38)
2011 to 2012[13]	1799	29	97.8	39 (41)
2010 to 2011[12]	1546	36	96.2	58 (61)

The levels of food colours observed in this survey were evaluated by HC's Bureau of Chemical Safety who determined that none of the samples would pose an unacceptable human health concern, therefore there were no recalls resulting from this survey.

References

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13. 2011-2012 Food Colours in Selected. (2018). Canada. Canadian Food Inspection Agency.
14. 2012-2013 Food Colours in Selected Foods. Canada. Canadian Food Inspection Agency. [unpublished data]
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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

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