

NATCOL Position on the Term ‘Natural Colour’ and the Categorisation of Food Colours

Executive Summary

The food colour market faces a changing pattern of demand with more value growth in ‘natural’ food colours at the expense of ‘artificial’ colours. Food manufacturers are replacing ‘artificial’ colours by more ‘natural’ colours and even scrutinizing the differences among the ‘natural’ colours. Terms such as ‘without artificial colour’ are prominently displayed on food packaging. But what are those marketing claims about? How do they translate into which colours were added to the finished foods making such claims? In order to provide clarity, NATCOL furnishes this position and guidance document which is a consensus reflection of the views of NATCOL member companies. NATCOL classifies food colours into four categories based on the key discriminators → occurrence in nature, → source material used, and → manufacturing process employed. Per category, NATCOL proposes ‘natural’ related voluntary labelling options such as “natural”, “natural origin” or “non-artificial”. The full classification of the colours and the labelling options are presented in annex I and II. The technical classification (decision tree) that leads to the four colour categories and the related labelling scheme are provided in annex II. All information in this document, in particular summarised information as in annex I and II, must be considered in the context of the whole document and in particular the legal notice in section 5.

1. Objective

Purpose of the present NATCOL document is to classify food colours between the two poles of 'natural' and 'artificial' by their varying degrees of perceived naturalness. The document is intended to serve as the basis and technical justification for the NATCOL food colours categorisation scheme in annex I and II. It reflects current thinking of NATCOL members on the naturalness of food colours in relation to voluntary label claims used on finished food labels. An attempt is made to propose marketing claims for food colours which under appropriate circumstances may be used in a way that is truthful and not misleading to consumers. The document has a clear focus to the European market and legal framework. Due to the lack of legal definitions the document might serve as important guidance of interpretation as it reflects the common opinion of the food colour industry represented in NATCOL.

2. Background

2.1 Colour imparting products

There is an increasing consumer preference for the use of natural colours; however the average consumer is probably unable to navigate through marketing terms such as 'not artificially coloured' or 'no colour added' used on the front of packaging and the ingredient list on the back panel. In addition, these marketing claims are not at all used in a consistent way by industry and the EU regulator does not provide a legal definition of the term 'natural' in relation to food colours. Furthermore, the colour imparting products permitted to colour foods, fall into different categories that the consumer is hardly aware of:

1. Food colours (additives) approved for use to colour foods (Regulation (EC) 1333/2008, Annex I 2.)
2. Foods with a primary colouring effect exempt from the food colour (additive) definition and to which no E-numbers are assigned (Annex I 2. aforementioned Regulation (EC) No. 1333/2008; often called 'colouring foodstuffs')¹
3. Foods with a secondary colouring effect (Art 3 (2) (a) (ii) Regulation (EC) No. 1333/2008 of the European Parliament and of the Council of 16

December 2008 on food additives (e.g. some paprika flavourings, saffron, squid ink).¹

4. Foods normally consumed as such (e.g. grape juice) and foods used as characteristic ingredients in a compound food (e.g. coffee in a 'coffee candy', or malt in 'malt bread') according to Art 3(2) (a) Regulation (EC) 1333/2008

2.2 Legal 'natural' definition and authority guidelines

Due to the lack of a specific legal definition for 'natural colour', general provisions of food law need to be applied to any voluntary label claims. Such claims shall be true and not misleading on the basis of Article 16 of Regulation (EC) No. 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety² and Article 7 (1) (a) 2 of Regulation (EU) 1169/2011 of the European Parliament and of the Council of 25 October March 2011 on the provision of food information to consumers³ in particular. Regulation (EC) No. 1334/2008 of the European Parliament and of the Council of 16 December 2008 on flavourings and certain food ingredients with flavouring properties for use in and on foods defines 'natural criteria' for 'flavouring substances' and 'flavouring preparations'. The key criteria applied in this regulation relate to:

1. Occurrence and identification of the substance in nature
2. Sourcing of the substance from a natural starting material
3. Principles applicable for the manufacturing processes employed

National regulatory bodies have issued national guidelines on the 'natural' subject, among others the UK's Food Standard Agency⁴ and the French DGCCRF⁵. Both of these guidelines recognise that the degree of 'naturalness' that consumers associate with an additive (colour) is less pronounced and nuanced than for a finished food/food category as such or for a food ingredient giving a finished food its characteristic properties. In line with this, both the UK FSA as well as DGCCRF set different criteria for food ingredients and additives in relation to the qualification for a 'natural' marketing claim. Thus, foods with a primary ('colouring foodstuffs') and secondary colouring effect would need to meet 'natural' criteria for food ingredients, and food colours would need to

meet standards applying for food additives. The French guidance note 2009-136 endorses a 'natural' scheme for food additives "Par analogie avec les règles applicables aux arômes....", i.e. "through analogy with the relevant regulation on flavourings", and it is reasonable to assume that the UK FSA may consider this approach similarly in a future revision⁶. The present NATCOL position presents a **similar but not identical view** in comparison to the French DGCCRF and UK FSA position regarding food additives. It is noted that the authority guidelines are not legally binding and in particular, the NATCOL position takes the **peculiarities of the food colours more specifically into account**⁷ for deriving a 'natural' classification scheme that sorts the food colours by their different degrees of perceived naturalness.

2.3 Legal specifications

As 'natural' and related claims for colours on foods normally refer to the colour imparting substances as such, a 'natural colour' definition should relate to the **colour as such and not to the commercial formulations** of it. In other words, claims should relate to the substances covered by the specifications in Commission Regulation (EU) 231/2012 of 9 March 2012 laying down specifications for food additives listed in Annex II and III to Regulation (EC) No. 1333/2008 of the European Parliament and of the Council. The legal specifications for the food colours usually contain a manufacturing process description as part of the specification. The specification for a given food colour may contain descriptions of more than one manufacturing process. For example, the specification for E 120 comprises carminic acid and aluminium lakes of carminic acid (carmines), and the specification for E 160b(i) covered until recently Bixin and Norbixin, and had now been split by the European regulator into E 160b(i) Annatto Bixin and E 160b(ii) Annatto Norbixin. The Norbixin is obtained by alkali hydrolysis of bixin. As some legal specifications of food colours cover more than one process of manufacture, colours within a given E-number may be split when categorised for the purpose of 'natural' claims. This concerns E 120 (Cochineal), E 161b (Lutein) and E 170 (Calcium carbonate) as can be seen in Annex I.

3. Principles and Definitions

3.1 'Artificial' and 'synthetic' mean different things

It is relevant to clarify for this position that in the context of food colours the attributes **'artificial' and 'synthetic'** should **not** be used **interchangeable**. The word 'artificial' is of Latin origin and means 'belonging to art, contrived by art'. Applied to a substance, 'artificial' means that the molecular structure of such a substance has not been identified in nature; and in biological terms it means that such substance is not known to the human physiology. In contrast, the Greek origin word 'synthetic' means 'composed, put together, combined' and in the context of a food additive simply points to the fact that the additive has been synthesised (chemically) without reference to the occurrence of a substance as such which in fact can either be artificial (e.g. azo-dyes), or found in nature (e.g. carotenoids). This differentiation between 'artificial' and 'synthetic' food additives in the context of 'natural' claims on food products is also recognised by the US FDA⁸. The former EU Council Directive 88/388/EEC relating to flavourings also made a distinction between 'artificial' and 'synthetic'.⁹

3.2 'Colour', 'Colouring principle' and 'Chromophor'

The food additive **'colour'** is legally defined in Annex I of Regulation (EC) 1333/2008. In the context of this NATCOL position, the term 'colour' is used to explicitly make reference to this legal definition.

In contrast, the term **'colouring principle'** is used for the colouring substance **as it is present in a natural starting material**. During processing of the 'colouring principle' to the final 'colour', some structural changes may happen to the 'colouring principle' which are detailed in the definitions below and in the Annex.

The term **'chromophor'** is defined as the molecular structure within an organic molecule, capable of selective light absorption that **causes that molecule to be coloured**. The concept of the 'chromophor' may be illustrated using Saffron as an example. In saffron, the carotenoid crocetin occurs among others as α -crocetin, a di-ester of crocetin and the sugar β -D-gentiobiose. Both, α -crocetin and crocetin are coloured and they contain the same 'chromophor' (or chromophoric group) which in this case is the carotenoid structure. When the α -crocetin is de-esterified, the solubility of the molecule for

example changes dramatically, however the colour imparting effect remains as the 'chromophor' as such was not affected by that chemical reaction¹⁰. Another example is bixin/norbixin where the de-esterification does not change the 'chromophor' either.

3.3. Colour categories used to divide and group food colours

'Color category N' is the umbrella category for all the colours in the (sub-) categories N1, N2 and N3.

'Colour category N1' contains those colours that are derived from plant, animal, mineral or microbiological source through traditional processing and/or appropriate physical processing. The manufacturing process overall does **not modify the chemical nature of the colouring principle**.

'Colour category N2' contains those colours that are derived from plant, animal, mineral or microbiological source through traditional processing and/or appropriate physical and chemical processing. The manufacturing process overall does **not modify the chemical nature of the chromophore** of the colour, however intentionally renders the colouring principle more suitable for use in targeted food applications (e.g. carminic acid/carmines).

'Colour category N3' contains those colours identical with a colouring principle **occurring in nature** and which are produced by **chemical synthesis**.

Colour category 'Caramel colours': The caramel colours E 150a-d are formed upon controlled heating of certain carbohydrates. The process usually involves the addition of certain substances such as acids, ammonia and sulphite compounds. The caramel colours are considered to be a separate category of colours as the differentiation criteria applicable for the colours in N1-N3 cannot be applied to the caramel colours because they neither occur as such in nature so that they could be found in a natural starting material (question 1), nor can the 'derived therefrom' differentiator between N1 and N2 be applied to differentiate between the caramel colours. Referral is made also to the position of EUTECA¹¹ on the classification of caramel colours for labelling purposes which differs from the views on caramel colours expressed in this NATCOL position as the EUTECA position categorises all caramel colours E150a-d as being neither 'artificial' nor 'natural'. For the sake of simplicity, the caramel colours were included in the list in

Annex I though (categories N1 and N2) as the voluntary labelling options are considered to be similar to those for N1 and N2 respectively. Plain caramel E 150a is considered different from the other caramel colours because the process of heating in combination with no addition or the addition of only acids or alkalis is viewed as a traditional process. For the caramel colours E 150b-d sulphites or ammonia compounds or a combination of both are employed during the heating process that forms the caramel colour substances.

Colour ‘Vegetable carbon’: This colour, E 153, though occurring in nature, forms upon a heating process which results in carbonisation of the natural starting material and insofar is different from the colours in categories N1-N3 as the colour is not already present in the starting material. For outlining potential labelling options (annex I and II-B), E 153 is considered similar to the colours in category N1.

Colours in **‘Colour category A’:** Colours that are not found in nature and not derived from a natural starting material. Colours in this category can also be called **‘Artificial colours’** in accordance with the definitions in 3.1 above. They are produced by a process of chemical synthesis.

Explanatory note

The full categorisation scheme for the food colours can be found in the annexes I and II to this position paper.

For the categorisation, the key discriminators of equal importance are:

1. Does the colour occur as such in nature?
2. Is the colour sourced from a naturally occurring starting material or derived therefrom?

Overall, questions 1 and 2 determine whether a colour can be considered ‘natural’ in some way or whether it is ‘artificial’. For the answer combination Yes/No, strict criteria apply because question 1 requires the colour (as found in the E-number specification; see ‘colour’ definition in 3.2) to occur as such in nature. Colours that meet this criterion are ‘nature-identical’ and are found in category N3. If the colour would only be the derivative of a colouring principle that occurs as such in nature, the answer to question 1 would be ‘No’. Question 2 is in particular relevant for differentiating ‘natural’ labelling options between categories N1 and N2 in annex I and II. The differentiation is based on

the term 'or derived therefrom' in question 2. Consequently, the categorisation into N1 or N2 is achieved by analyzing the impact of the processes applied: Is the chemical structure of the food 'colour' the same as that of the 'colouring principle' in the starting material (→ N1), or was only the structure of the 'chromophore' retained (→ N2)? The answer to these questions determines in which colour category a 'colour' is placed. Regarding the applied processes, it is important to note that the differentiator for the categorisation of a colour is less the process as such but rather **its effect on the colouring principle** even though the terminology 'traditional' was still included in the colour category definitions (see also section 3.4 below) as it is frequently used in the context of the 'natural' discussion. It is also important to note that there is no intention to imply that category N2 is considered more 'natural' than N3. The difference between N2 and N3 is based on the fact that those differ in their answer pattern to the two questions of equal importance (occurrence of colour as such in nature, sourced from a natural starting material) where the answers are No/Yes for category N2 and Yes/No for N3. As both facts are equally important, no difference in 'naturalness' is implied between N2 and N3.

3.4 'Traditional process'¹², 'Appropriate physical process' and 'appropriate chemical process'

A '**traditional process**' is a process with a considerable **history of use** for the processing of food colours and which is well established in the food colour industry. It includes but is not limited to grinding, cutting, maceration, solvent extraction¹³, microbiological fermentation processes, heating, cooling and freezing, drying, filtration, distillation, rectification and others. A traditional process is often but not necessarily a physical process and can or cannot involve chemical reactions which are usually but not always unavoidable and unintentional.

An '**appropriate physical process**' is a physical process which is well-established in the food colour industry and which does not modify the chemical nature of the colouring principle. An 'appropriate physical process' includes but is not limited to absorption/adsorption, chromatography, ion-exchange, electrophoresis, ultrasonic treatment, centrifugation, (reverse) osmosis, crystallisation, precipitation, lyophilisation, enzymatic processes and others.

The term ‘**appropriate chemical process**’ for the purpose of this NATCOL position comprises **intentionally** triggered **simple chemical reactions** such as acidification/basification, hydrolysis, salt formation, ester cleavage, chelate formation, cis/trans- and other isomerisations. An ‘appropriate chemical process’ is confined to rendering a colouring principle **more suitable for use in targeted food applications**, e.g. removal of a (ester-bound) fatty acid from a colouring principle to allow the use of the resulting food colour in a more hydrophilic food matrix. Depending on the concrete process, an ‘appropriate chemical process’ may be considered a ‘traditional process’ as defined above. For example, the use of alkali to convert bixin into norbixin (an ester cleavage reaction) during the annatto extraction is certainly a traditional ‘chemical processing’.

4. The labelling options

4.1 Mandatory labelling

The labelling of consumer food must comply with the requirements of Regulation (EC) No. 178/2002¹ and Regulation (EU) 1169/2011². The latter requires in Art 7 (1) (a) that the labelling, presentation and advertising of foodstuffs must not mislead a consumer particularly

- as to the characteristics of the food and, in particular, as to its nature, identity, properties, composition, quantity, durability, country of origin or place of provenance, method of manufacture or production;

It is also required based on Art 18 in connection with Annex VII Part C of Regulation (EU) 1169/2011 that colours are listed in the ingredient list by their function “colour”, followed by specific name or E-number.

Following publication of Regulation (EC) No. 1333/2008, it is now also incumbent on manufacturers to apply a specific warning labelling for foods containing certain artificial food colours¹⁴.

NATCOL considers it of utmost importance that all the food colours occurring in nature are clearly distinguished and differentiated from these six artificial colours and artificial colours in general. This is of particular importance for the ‘nature-identical’ colours in colour category N3. These colours are neither ‘natural’ (colour category N1) within the labelling concept presented in annex II of this position paper nor ‘artificial’ (colour category A) since they occur in nature and are known to the human physiology - if

present in the human diet, such as carotenoids.

4.2 Voluntary label claims

NATCOL observes that voluntary label claims in relation to food colours, such as ‘does not contain artificial colour’ or ‘free from artificial colour’ and similar wordings are frequently used on food product labels. It is assumed that manufacturers determined that the concrete food colours used in relation to the pertinent claims are not perceived by consumers as misleading in the concrete context in which they are made (type of food, overall image given to the product, label claims, in particular ‘natural’ claims for the food). NATCOL notes that interpretations on this matter by consumers and industry may vary and due to this the use of additional qualifying language may be helpful.

In annex I and II-B NATCOL proposes conceptual options for voluntary marketing claims for food colours in relation to the different colour categories. It is NATCOL view that manufacturers of finished food may be able to determine circumstances under which the proposed principle claims in annex I and II-B may be made without misleading consumers.

Annex I and II-B proposes three types of principle claims:

1. A claim as to the fact that a colour is ‘non-artificial’, applicable for the colours in categories N1 –N3, which may translate on a label into: ‘does not contain artificial colours’
2. A claim pointing to the fact that a colour occurs in nature, was produced from or derived from a natural starting material, applicable for the colours in categories N1, N2 and N3 respectively which may translate on a label into : ‘only with colours of natural origin’ (N1), or: ‘with nature derived colours’ (N2), or ‘with nature-identical colour’ (N3)
3. A plain ‘natural’ claim for colours in category N1 which may show on a label as: ‘with (added) natural colour’

It is reiterated that NATCOL in general recommends the use of qualifying language to make claims more instructive and potentially less misleading for consumers; this concerns in particular plain ‘natural’ claims, or even stronger ‘all natural’ or ‘100 %

natural' claims. If such explicit claims are made, it is all the more important to not mislead consumers. It should be pointed out in this context that food colours are usually formulated into a variety of commercial preparations tailored to allow best colour performance in the various target food applications¹⁵. These preparations of food colours are manufactured with the help of conventional food ingredients (e.g. starch) as well as food additives (e.g. emulsifiers) as the case may be. An 'all natural' or '100 % natural' claim in relation to a food colour may suggest that the entire food colour preparation qualifies for a 'natural' claim which may or may not be the case.

5. Legal notice

The present NATCOL guidance document, and in particular section 4.2 and the annex I and II-B, has been produced with the aim of providing informal guidance. It has to be read in conjunction with the relevant legislation. The guidance given by NATCOL in this position is not a substitute for legal advice nor is it an authoritative interpretation of the law. The content of this document does not relieve NATCOL members or any other persons of their obligations under the applicable laws.

6. Notes

1: for more information on colouring foods: see NATCOL Code of Practice on colouring foods. <https://natcol.org/natcol-has-developed-a-code-of-practice/>

2: Regulation (EC) No. 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety; Article 16: "Without prejudice to more specific provisions of food law, the labelling, advertising and presentation of food or feed, including their shape, appearance or packaging, the packaging materials used, the manner in which they are arranged and the setting in which they are displayed, and the information which is made available about them through whatever medium, shall not mislead consumers."

3: Regulation (EU) 1169/2011 of the European Parliament and of the Council of 25 October March 2011 on the provision of food information to consumers; Art. 7 (1) (a) : "Food information shall not be misleading, particularly: (a) as to the characteristics of the food and, in particular, as to its nature, identity, properties, composition, quantity, durability, country of origin or place of provenance, method of manufacture or production;"

4: FSA: Criteria for the use of the terms fresh, pure, natural etc. in food labelling, revised July 2008. It is noted that the UK is no longer part of the EU. However, this guidance document remains a valuable reference as it had been widely recognized within the EU.

5: DGCCRF Note 2009-136

6: The UK FSA guideline, revised July 2008, is at least partly outdated (in particular with regards to paragraph 55c on food additives) as it references in paragraph 55d EC Directive 88/388/EEC which was replaced by Regulation (EC) 1334/2008 which entered into force in January 2009. In addition: see footnote 3.

7: Neither DGCCRF nor FSA go into such detail of differentiation within a food additives category as they are focused on finished foods. However, the NATCOL approach also applies the same three key criteria as such in the 'natural' qualification' process.

8: Informal FDA policy in 58 Fed. Reg. at 2407 of January 6 1993: The term NATURAL means: nothing artificial or synthetic has been included in, or has been added to, a food that would not normally be expected to be in the food.

9: Directive 88/388/EEC differentiated three types of flavouring substances. Although two of those could have been produced by chemical synthesis, only one of those was designated as 'artificial' while the second type of synthetically produced substances was designated as 'nature-identical'. The fact that these different types of flavouring substances are no longer defined by law, does not question the different meaning of 'artificial' versus 'synthetic'.

10: A discussion of auxochromic groups and associated bathochromic or hypsochromic effects as well as the effect of salt formation/ pH-change on the absorption of the 'chromophor' are left out of scope as those effects, even though related to the chemistry of colour molecules, are not considered relevant for a 'natural' classification of food colours

11: EUTECA is the European Technical Caramel Association; <http://www.euteca.org/>

12: A. For 'flavours' traditional processes are defined in Regulation (EC) 1334/2008
B. NATCOL notes aside that the EU food regulation (in particular Regulation EC 1334/2008) does not stipulate since when a process needs to be in use to be considered 'traditional'. In other EU legislation (Directive 2004/24/EC on traditional herbal medicinal products) 'traditional use' is defined as a history of use for a minimum of 30 years.

13: NATCOL considers that 'extraction' includes but is not limited to the solvents permitted for use as an extraction solvent in the production of foodstuffs in Directive 2009/32/EC of the European Parliament and of the Council of 23 April 2009 on the approximation of the laws of the Member States on extraction solvents used in the production of foodstuffs and food ingredients. NATCOL notes also that in the second sentence in Art 1 of this Directive, 'food additives' (among others) are exempt from the requirements in this Directive.

14: Art 24 of that regulation in connection with Annex V requires the labelling of E 110, E 104, E 122, E 129, E 102 and E 124, when used in foods, to show the additional information: "May have an adverse effect on activity and attention in children"

15: Other reasons for commercial colour preparations are: assurance of a uniform and homogeneous dosage of the colour in the target food and to provide convenience in handling during food production.