Technical Information Sheet

Foodstuffs which provide colour

prepared for

The Brewers of Europe

by

Campden BRI

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June, 2014.

Contents

Abbreviations

ADI – Acceptable Daily Intake
AFC – EFSA Panel on Food Additives, Flavourings, Processing aids and Materials in Contact with Foods
AFSSA - Agence Française de Sécurité Sanitaire des Aliments (France)
COT- Committee on Toxicity (UK)
EC – European Commission
EFSA – European Food Safety Authority (EU)
EU – European Union
FAO - Food and Agriculture Organization of the United Nations
FDA – Food and Drug Administration (US)
FSANZ – Food Standards Australia New Zealand
GM – genetically modified
HACCP – Hazard Assessment by Critical Control Points
JECFA - Joint FAO/WHO Expert Committee on Food Additives
NTP – National Toxicity Programme (US)
SCF – Scientific Committee for Food (EU)
SCFCAH – Standing Committee on the Food Chain and Animal Health (EU)
WHO - World Health Organisation

Part 1. Non-technical Summary

- Colouring foodstuffs are foodstuffs which impart colour to a food, while also imparting other characteristics, such as flavour, aroma and/or nutritive value.
- Colouring foodstuffs may be used in the form as extracts, but the colour must not be concentrated with respect to other characteristics more than a certain amount.
- Extracts of colouring foodstuffs in which the colour is significantly concentrated with respect to the other characteristics, such as flavour or nutritive components, are classed as food additives (colours) rather than colouring foodstuffs.
- Colouring foodstuffs must be safe to consume, as must any food, but do not have to be specifically authorised for use in a particular food product.
- Food colours, however, must be authorised under the EU food additives legislation for use in each specific food, and conditions of use, such as maximum use levels, may be specified.
- In an ingredients list, food colours are identified as such because they must be preceded by the word “colour”. Colouring foodstuffs are listed as ingredients.
- Most of the colour in beer is derived from the malts which are used. As well as providing colour, however, malts also have other important characteristics: they provide starch (which is turned into sugar and then fermented to form alcohol), flavour, foam character, vitamins and antioxidants. Malts are therefore described as characterising ingredients for beer.
- As a general rule, malts which are more intensely heated (kilned) are darker in colour and richer in flavour than more lightly kilned ones, with flavour notes such as biscuit, caramel and chocolate being associated with an increasing extent of kilning.
- Malts extracts may also be used to produce beer. The colour and flavour of malt extracts depends upon the blend of malts used. However, if the extraction process significantly concentrates the colour with respect to flavour and/or sugar content, it would be classified as a food colour.
- Beer types which demand a dark colour without the accompanying flavour can be coloured with caramel, which is the only food colour currently permitted for use in beer in the EU.

Part 2. Technical Summary

- Colouring foodstuffs are foodstuffs which impart colour to a food, while also imparting other characteristics, such as flavour, aroma and/or nutritive value.
- Colouring foodstuffs may be used in the form of extracts, but the colour must not be concentrated with respect to other characteristics.
- Extracts of colouring foodstuffs in which the colour is significantly concentrated with respect to the other characteristics, such as flavour or nutritive components, are classed as food additives (colours) rather than colouring foodstuffs.
- The extent of concentration is calculated as the enrichment factor. This is the ratio of the colour to flavour (or nutritive value) in the extract, divided by the same ratio for the source material. If this is greater than 6, the extract is deemed to be selectively concentrated and should be classified as a food colour.
- Colouring foodstuffs are not classified as additives and are not subject to EU food additive legislation.
- Colouring foodstuffs must be safe to consume, as must any food, but do not have to be specifically authorised for use in a particular food product.
- Colouring foodstuffs must comply with general legislation applicable to other foods with respect to production, packaging, transport and storage. They must conform to legislation controlling relevant chemical and microbiological contaminants. The production process must have a documented risk assessment system and traceability must be maintained. All materials coming into contact with colouring foodstuffs must be suitable for food use. Extraction solvents used must be authorised in the EU for food use.
- The source materials for colouring foodstuffs must be normally consumed as such in the EU. If this is not the case, it may be necessary to make an application under the novel foodstuffs legislation.
- Most of the colour in beer comes from malts and malt extracts. Malts and malt extracts which are not selectively extracted are classified as characterising ingredients for beer since they provide a range of essential constituents, including flavour, aroma, fermentable sugar, foam proteins and nutrients, as well as colour.
- Malt extracts and Farbebier would normally be described as colouring foodstuffs. However, if the colour has been selectively extracted with respect to the flavour or nutritive constituents they may be classified as food colours depending upon the extent of enrichment.
- Currently, the only food colour authorised for use in beer is caramel.

Part 3. Technical Data

1. Legislative framework

1.1 EU Food additives legislation

In the EU, the use of food additives, including food colours, is controlled by Regulation 1333/2008 *(EU, 2008)*.This regulation lists all authorised food additives and colours, their conditions of use, and the foodstuffs in which they may be used. It was amended in May 2014 to impose an upper limit for the use of ammonia caramel (E150c) in beer *(EU, 2014).* It defines colours as:

"substances which add or restore colour in a food, and include natural constituents of foods and natural sources which are normally not consumed as such and not normally used as characteristic ingredients of food. ***Preparations obtained from foods and other edible natural source materials obtained by physical and/or chemical extraction resulting in a selective extraction of the pigments relative to the nutritive or aromatic constituents are colours within the meaning of this Regulation."***

Some authorised colours which come under the definition above of preparations from natural source materials are listed in Table 1.

Table 1. Some food colours obtained from natural sources

Colour	Food source	E number
curcumin	turmeric	E 100
cochineal	insect *Dactylopius coccus*	E120
chlorophylls	green leafy plants such as spinach	E140
copper complexes of chlorophylls	green leafy plants such as spinach	E141
beetroot red (betanin)	beetroot juice	E162
anthocyanins	mainly fruit such as grape skin blackcurrant	E163

However, this legislation also states that foods and substances normally used as characterising ingredients in food are NOT classified as food colours even if they have a secondary effect of adding colour to the final food. Thus foodstuffs normally consumed in the EU, such as fruit juices, tomato concentrate or coffee, would NOT be classified as food colours, even though they do have a colouring effect. They are classified as ingredients, and should be labelled as such *(SCFCAH, 2013).* Such foods are described as colouring foodstuffs.

Complications arise when secondary products are prepared from coloured foodstuffs by a range of techniques, including drying, concentration and chemical extraction. These secondary products may be classified either as food colours (ie additives) or colouring foodstuffs, depending upon the extent to which the colour has been concentrated with respect to other characteristics of the food (see Section 1.2).

1.2 EU guidance notes on "colouring" foodstuffs.

The EU has issued guidance notes on the distinction between food colours (which are additives and need to be authorised under Regulation 1333/2008) and colouring foodstuffs, which do not need specific authorisation *(SCFCAH, 2013).* Although these Guidance Notes have been put together by a Standing Committee of the Commission, they are intended for guidance only and are not legally binding. In the event of a dispute regarding interpretation, only the European Court of Justice can give a ruling. The Guidance Notes are also incomplete, for example, reference values for source materials (for colouring foodstuffs) have yet to be determined.

1.3 Difference between food colours and colouring foodstuffs:

- According to Regulation 1333/2008 products prepared from foods and food ingredients which retain their essential characteristics in terms of flavour, aromatic properties and nutritive content and in which the ratios of colouring pigments to nutritive and aromatic constituents have not been significantly changed are not regarded as food colours whether in their raw state or in a processed form such as an extract. **These are colouring foodstuffs.**

- Products in which an extract of a coloured food has been processed in order to significantly increase the ratio of colouring pigments to nutritive or aromatic constituents with respect to the ratio in the original source material is classified as a **food colour.**

1.4 What constitutes "significant" enrichment?

Regulation 1333/2008 does not offer any explanation of what constitutes "significant enrichment". The Guidance Notes therefore provide a formula for calculating this, and also a useful Decision Tree.

The enrichment factor is calculated as follows:

$$Ff = \frac{Cp / Ap}{Cs / As} \qquad Fn = \frac{Cp / Np}{Cs / Ns}$$

where
Ff = enrichment factor with respect to aromatic (flavour) content
Fn = enrichment factor with respect to nutritive content

Cp = colour (pigment) content of colouring product
Cs = colour (pigment) content of source material

As = aromatic (flavour) content of colouring product
Ap = aromatic (flavour) content of source material

Np = nutritive content of colouring product
Ns = nutritive content of source material

A threshold value of **6** for either Ff or Fn is proposed to indicate selective extraction.

<u>If either the Ff or the Fn exceeds 6, then it is proposed that the product be classified as a food colour.</u>

The calculation can be significantly affected by the reference values for constituents in source materials. These have not yet been agreed. Until these have been set, it is the responsibility of the manufacturer to provide data in support of a claim that a product is a colouring food as opposed to a food colour. Nevertheless, the brewer also has a responsibility to ensure that the materials he uses conform to legislation. The Brewers of Europe has provided a template letter which may be sent to manufacturers to request information on the classification of colouring products (see Annex).

1.5 Consequences of classification

If a product is classified as a **colouring food**, then it must be used in accordance with the general rules of food law as set down in Regulation 178/2002 *(EU, 2002).* This means that:

- Specific approval for use of the product in a certain food (eg beer) is not required
- The product must be safe and conform with relevant EU food legislation
- Use must not mislead consumers
- It must conform to any relevant limits on contaminants set down in EU law
- Relevant traceability reqirements must be met
- Potential manufacturing risks must be assessed under a written HACCP procedure
- If ingredient labelling applies, the product must be declared on the label as an ingredient. Labelling must also conform to the requirement of the Food Information to Consumers legislation, for example, with respect to declaration of any listed allergens, even for products such as alcoholic beverages for which ingredient listing is not mandatory *(EU, 2011).*
- Use must conform to any relevant **national legislation**. Some EU member states (for example, Germany) have compositional legislation which limits the ingredients which can be used in the manufacture of beer.

If a product is classified as a **food colour**, then;

- Use in specific foods (eg beer) must be authorised under Regulation 1333/2008. (Currently the only food colour allowed for use in beer is caramel).
- It must conform to any purity specifications laid down for food colours *(EU, 2012).*
- The product must be declared on the label as an additive (colour); labelling must conform to the requirement of the Food Information to Consumers legislation, for example, with respect to declaration of any listed allergens *(EU, 2011).*

2. Beer colour

For most beers, the colour is derived from the malts used. Speciality malts are malts which are prepared using special conditions of germination and kilning to maximise colour and flavour formation (see section 2.1). Sometimes malts may be used in the form of malt extracts, which are pre-mashed. If a darker colour is required without the flavour associated with speciality malts, the food colour caramel may be used. This is the only food colour authorised for use in beer in the EU. For beers brewed according to the Reinheitsgebot, which does not allow the used of food colours, Farbebier (literally, colour beer) can be used.

2.1 Speciality malts: Traditional beer colour – in the pale yellow – red-brown - black spectrum is provided by speciality malts, which are prepared by different germination and kilning regimes in order to produce specific colours. The different production regimes mean that different coloured products also have characteristic flavours, and other associated characteristics, such as foaming properties and antioxidant content. The colour is not selectively enhanced with regard to the other characteristics. Speciality malts are therefore **characterising ingredients.**

2.2 Malt extracts: A very wide range of malt extracts are now available. Traditionally, malt extracts are made by mashing a selected blend of malts to produce a wort which is then concentrated by removal of water, producing a thick sticky liquid high in sugar, and with colour and flavour properties dependant upon the blend of malts used. By selecting different types of malt as starting materials, extracts covering a wide range of depth of colour, from pale lager coloured to dark brown, can be obtained. Such extracts will, however, also contain the flavour components and sugar spectrum associated with the malt types selected. As no differential concentration of colour with respect to other characteristics (particularly flavour and sugar content) is involved, such malt extracts are described as **ingredients** in beer**.** They may also be used as **colouring foodstuffs** in a range of other foods.
It is however technically possible to selectively extract speciality malts in order to enhance either the colour or the flavour characteristics. The sugar content is also generally reduced in such extracts. If the enhancement factor of the colour with respect to the aromatic (flavour) or nutritive (sugars) properties exceeds the proposed threshold, then such a malt extract would be classified as a **food colour**.

2.3 "Colouring" beer (Farbebier). This is a beer which is brewed from a very highly roast malted, then "fermented", lightly hopped and concentrated. Simple removal of water produces a range of products, some of which are strongly flavoured as well as coloured, depending upon the original malt blend used. However, concentration by vacuum evaporation also removes volatile (flavour) constituents, to a greater or lesser extent *(Hormes, 1998: BrauIndustrie, 2004)*. The colour can range from 3000 to 15,000 EBC units. This compares with a colour of 1,300 EBC for a typical roast malt. Thus, although Farbebier qualifies as a beer according to the German Reinheitsgebot, it is possible that some types could be classified as a food colour if the concentration of colour with respect to flavour components and/or nutrients exceeds the prescribed threshold.

2.4 Caramel. Caramel 150c may be used up to 6000 mg/kg in all beers and up to 9,500mg/kg in certain darker types of beer. Caramels 150a,b and d may be used at *quantum satis* level *(EU, 2014).* In practice, ammonia caramel, 150c, is used most because of pH constraints. No other food colours are authorised for use in beer.

2.5 Other materials used for colouring beer
Although most beers will use the materials described above (2.1 – 2.4) to provide colour, a range of other food-derived colourings have been reported to be used in beers, malt beverages and beer-like beverages (see Table 2).

Table 2. Foods reported to be used for colouring beers in the EU

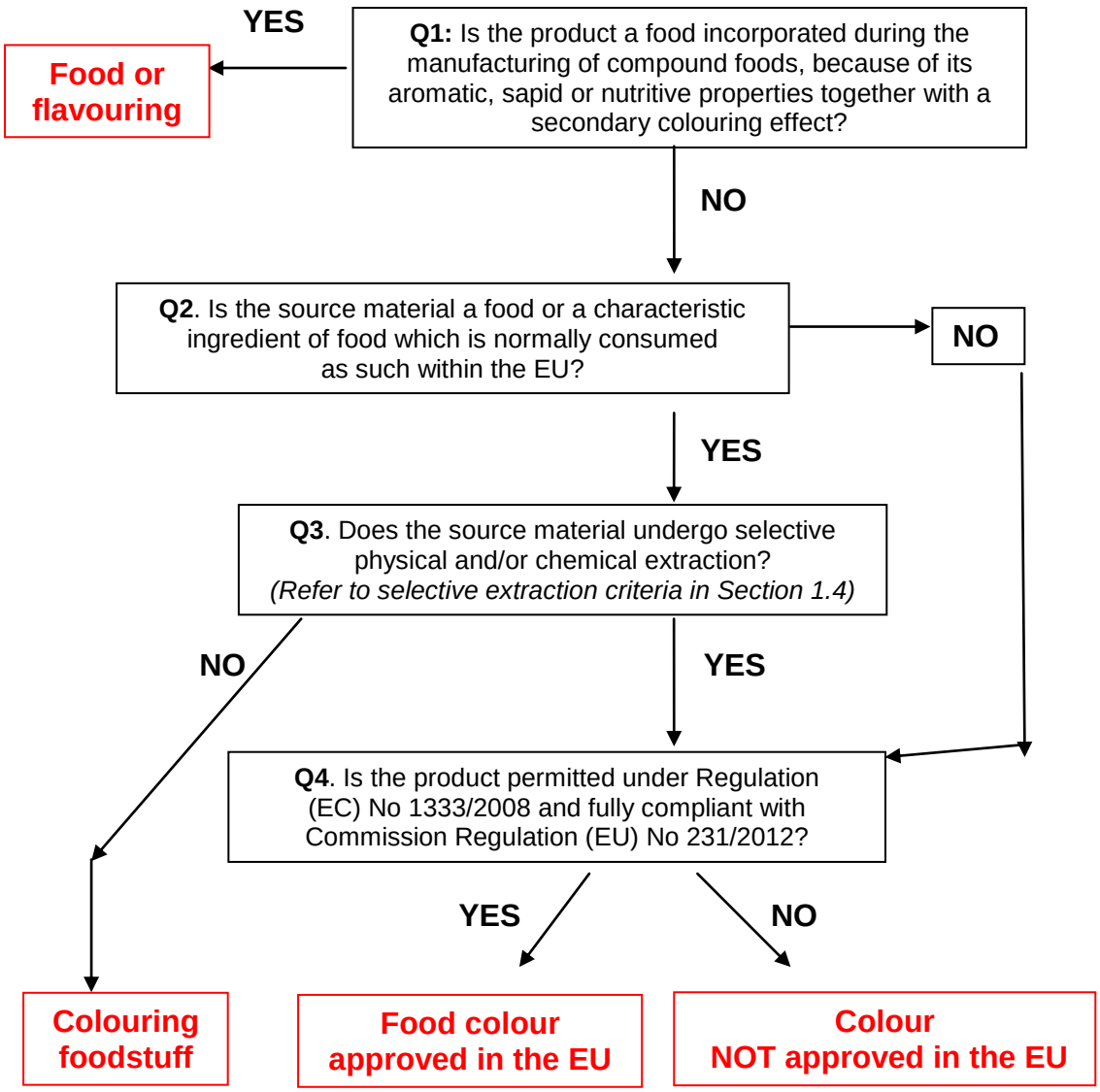
Product
Blackcurrant concentrate
Carrot concentrate
Elderberry juice

For each of these products, their classification as a food colour or a colouring food will depend upon the extent to which the colour is concentrated with respect to aromatics (flavour) or nutritive constituents during the manufacturing process. If the concentration of either exceeds 6, then the product would be regarded as a food colour, and it could not be used in beer without specific authorisation under Regulation 1333/2008. It is the responsibility of the manufacturer to determine the extent of selective concentration of colour and thus whether the product is classified as a colouring foodstuff or as a food colour. If the product is classed as a food colour, then authorisation for use in beer would need to be obtained from the Commission under Regulation 1333/2008.

2.6 Classification as a food colour or a colouring foodstuff.

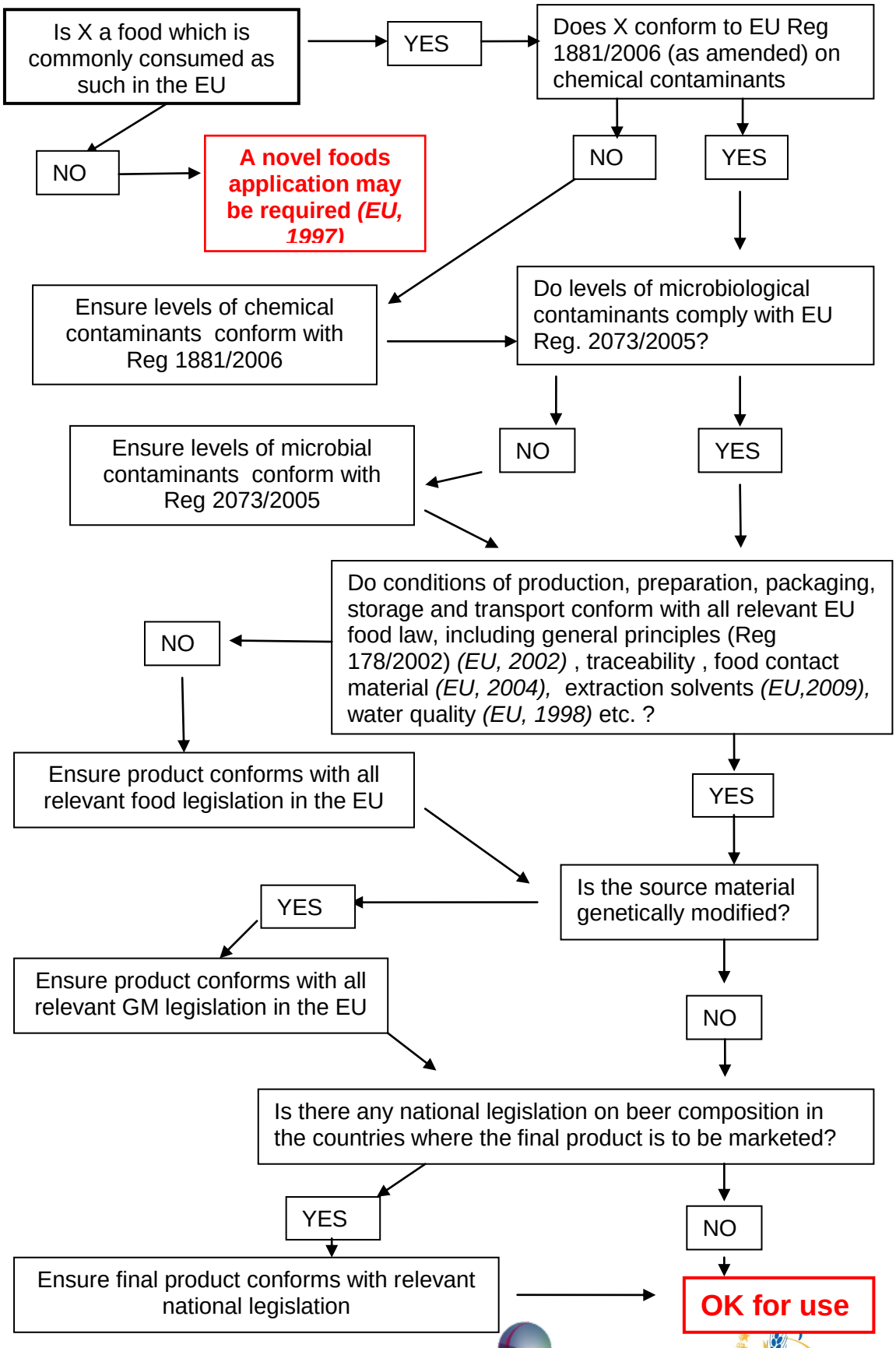
The EU guidelines provide a useful Decision Tree to help distinguish between food colours and colouring foodstuffs *(see Figure 1)*.

Figure 1. Decision tree for distinguishing between food colours and colouring foodstuffs *(SCFCAH, 2013).*



3. Compliance with legislation

Figure 2. Decision tree for colouring foodstuff X



Colouring foodstuffs are unlikely to be hazardous, especially if they are already normally recognised as foods and consumed in the EU. They must however conform to all relevant food legislation in the EU. If there is little or no legislation, then it is the responsibility of the brewer to ensure that products used are safe for human consumption. This means that, especially for foodstuffs which are not normally consumed in large quantities (for example, herbs or spices), the brewer should conduct as risk assessment to ascertain what the material might be likely to contain that is injurious to human health, and test accordingly or set relevant specifications. A HACCP-like approach such as that outlined in Figure 2 may be helpful in carrying out a risk assessment.

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Part 4. Frequently Asked Questions

Q1. What are colouring foodstuffs?
A1. Colouring foodstuffs are foods which are normally consumed in the EU, but which may be added to other foods in order to impart colour.

Q2. What is the difference between colouring foodstuffs and food colours?
A2. Colouring foodstuffs generally have other effects on the food as well as adding colour. For example, they may add flavour, texture or increase the nutritive value. Food colours only impart colour: they may be synthetic or selectively extracted from natural materials so that the colour is concentrated. Use of a food colour in a particular foodstuff must be authorised under EU food additives legislation.

Q3. Can colouring foodstuffs be extracted as well?
A3. Yes, extracts of colouring foodstuffs are allowed, but the colour may not be enriched with respect to the flavour or nutritive value. If the colour is significantly enriched, then the product is classified as a food colour.

Q4. How can I tell whether food colours of colouring foodstuffs have been used in a particular food?
A4. If the product bears an ingredient list on the label, colouring foodstuffs are listed as such, while food colours are listed under additives, preceded by the word “colour”.

Q5. Are food colours used in beer?
A5. The only food colour currently authorised for use in beer is caramel, which may be used to add colour without intensifying flavour.

Q6. Are colouring foodstuffs used in beers?
A6. Most of the colour in beer comes from the malts which are used in brewing. Speciality malts are malts which have been heated to a higher temperature during the kilning stage and have therefore developed darker colours and stronger flavours. However, all malts perform several functions in brewing: not only do they provide colour and flavour, but they are also the main source of the fermentable sugar which is converted to alcohol, as well as providing proteins to support beer foam and nutrients which are essential for yeast growth. Malts are therefore described as characterising ingredients in beer. Malt may also be used in the form of an extract, and this is also an ingredient. However, if the malt extract is selectively extracted in order to concentrate the colour substantially more than other characteristics such as flavour and/or nutritive value, then it is classified as a food colour.

Other ingredients, such as fruit juices and concentrates, may be added to some beers. These are generally used to provide specific flavours, but may also provide some colour, in which case they would be classified as colouring foodstuffs.

Annex 1. The Brewers of Europe template letter

Dear,

The European Commission's Standing Committee on the Food Chain and Animal Health has adopted a Guidance Note on the classification of food extracts with colouring properties. Its objective is to provide simple and practical criteria for the differentiation between foods with colouring properties and additive food colours within the European Union.

As a result, our company is assessing the need for either reviewing labelling or the composition of our products.

For this purpose, [name of the company] would value if you could provide information on the selective of non-selective process of [name of the product(s) under scrutiny].

Yours sincerely,

[signature]


The Brewers of Europe