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Replacing the Southampton 6

Introduction

This factsheet looks at the issues involved in product reformulation as they relate to replacing synthetic colours with more natural alternatives. At Campden BRI, we can offer help in this and the full range of product development activities, including trials at pilot plant scale.

In 2007, scientists at Southampton University published results of research carried out to determine the effect of certain artificial colours and benzoate on hyperactivity in children. The Food Standards Agency concluded from the findings that these synthetic colours should be removed from all food product types voluntarily by the UK food industry, by 2009. Subsequent to this study the European Parliament adopted new labelling regulations for foods containing any of the food colours; these must be labelled with not only the relevant E number, but also with the words "may have an adverse effect on activity and attention in children".

The colours concerned are:

- tartrazine (E102)
- quinoline yellow (E104)
- sunset yellow (E110)
- carmoisine (E122)
- ponceau 4R (E124)
- allura red (E129)

Recently, there has been a recommendation to lower the Acceptable Daily Intake of three of the colours (quinoline yellow, sunset yellow and ponceau 4R). This may mean that levels allowed in foodstuffs, or the range of foodstuffs in which they are permitted will be reduced.

Replacement

In light of these studies the drive to replace these synthetic colours with either purified pigments from foodstuffs or just a concentrated highly coloured foodstuff has gained much more importance for food manufacturers. Unfortunately, these replacements are inherently more unstable than the synthetic colours that they are replacing, with resulting problems for food manufacturers looking to retain the

same colour for the same shelf-life in their existing products. This is particularly the case for heavily heat processed products in transparent packaging with a long shelf-life. It is more difficult to replace and match a synthetic colours in an existing product than it is to develop a new product using natural colours.

In addition, the alternatives will individually never be an identical match to the original, and considerable expertise and experience is needed to reformulate the entire product.

The main factors to consider when selecting natural colours are:

1. food matrix (oil or water soluble colours needed)
2. recipe: some ingredients can have a positive or negative effect on colour stability. e.g some protein and sugar can help to stabilise colours.
3. pH.
4. processing
5. packaging - if colour is sensitive to light
6. legislation
7. price

Colour pigments

There are four main classes of plant pigment: chlorophylls, carotenoids, flavanoids and betalains, which account for the majority of naturally derived colours added to food. The main permitted food colourings derived from natural sources are:

Chlorophyll
Copper Chlorophyll (chemically modified)
Curcumin
Lutein
Paprika
Mixed carotenes
Beta-carotene*
Annatto
Carmine
Anthocyanins
Beetroot red

**Synthetic beta carotene is widely available*

All the major UK retailers have also been very active in removing or replacing artificially derived colours from their products. Many have removed synthetic colours and replaced with natural colours and colouring foodstuffs. Where naturally derived food colours are used, these have been used at the minimum level to achieve the desired colour.

Colouring foodstuffs

All added colours must be declared on a food product in the EU. Manufacturers can choose to declare these either by name or E number. In the EU there is no legal distinction between artificial and natural food colours. However, food manufacturers are keen to use colours derived from naturally occurring pigments or, more recently, colouring foodstuffs which do not have to be declared as colours. According to the FSA Food Additives Legislation guidance notes (2002) colouring foodstuffs must not have been selectively extracted during their preparation or they would be considered a food colour and fall under these regulations. Colouring foodstuffs will therefore impart both colour, flavour and nutritive components to the food and their usage rate is generally higher than comparable additive colour. Examples of colouring foodstuffs include fruit and vegetable juice concentrates such as elderberry (red), spinach (green) and pumpkin. Care must be taken when planning to use these colouring foodstuffs to gain assurances from the colour supplier that it has not been selectively extracted and it is a foodstuff which has a history of consumption in Europe. Colouring foodstuff suppliers select raw materials with high levels of natural pigment and the final formulations are standardized for colour to prevent batch-to-batch variations.

Improving stability

The stability of some of the naturally derived colours is generally much more affected by the food matrix and both the processing and storage conditions that the foodstuff undergoes, than the synthetic colours. For example, pH, temperature/heat, oxygen, light, water activity and other ingredients will all affect how a colour will perform. Much work has been undertaken to both understand and improve the stability of naturally derived food colours. Many natural colour manufacturers have developed colour formulations with extra stability under some storage conditions. For example, one area that colour manufacturers have worked on is in improving water dispersible forms of naturally oil soluble pigments such as carotene, where colour emulsions tend to produce a colour ring in the bottle neck of soft drinks. This has involved both the control of the homogenisation process to achieve the correct droplet size and the selection of the correct emulsifiers and stabilisers.

Replacing synthetic colours with natural colours is a complex process. As has been discussed, a number of factors need to be considered such as food legislation, the intrinsic properties of the food, the processing conditions, the intended storage conditions and the product shelf-life. Contact us now to discuss your reformulation problems or to trial some of your ideas in our process hall.

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