**Water-soluble natural yellow dye**

**Natural yellow dye**

**Identification**

**Key words**
- phloridzin
- dye
- water-soluble
- yellow
- apple
- enzyme
- natural
- food colorant

**Latest version**
- 2013/09/05

**Completed by**
- INRA - IATE

**How does it work?**

**Primary objective**
- Water-soluble yellow dye suitable for food applications with improved properties (4)

**Working principle**
- Up to date, the most commonly used yellow dyes in the food industry have been tartrazin and curcumin, both showing disadvantages: tartrazin is targeted in the context of evolving food safety regulations in Europe and North America and curcumin has limited applications because of its low water solubility.
- A new water-soluble dye has been produced: Phloridzin Oxidation Products (POP).
- Phloridzin is a natural polyphenol specific to apples, which natural oxidation, in juices or ciders for example, leads to POP. (3)(5)
- To produce the dye, oxidation of phloridzin in apple pomace (= solid waste of juice production) has been triggered by enzymatic conversion, leading to a family of similar molecules that constitute the dye.
- The POP dye is highly water-soluble with a strong colouring capacity from bright yellow (pH < 5) to orange (pH > 6), see figure below (1)(2).

**Images**

**Additional effects**
- The POP dye can also be esterified in ethanol/HCl, leading to a 98% yield. Both the POP dye and its ethyl ester show free radical-scavenging activities comparable to those of well-known antioxidants such as ascorbic acid, trolox or (−)-epicatechin. (2) Therefore, they can be be used as antioxidative food additives.
- Besides food applications, the POP dye can also be used in cosmetics and hygiene. (1)

**Important process parameters**

**Important product parameters**
- The pH of the medium to be dyed will impact the final colour.
- Half saturation at pH 3 was obtained for a concentration close to 30 mg/L.
- POP is only weakly degraded by prolonged storage at ambient temperature (with minor variations depending on the pH) (2)
What can it be used for?

**Products**
Usable in all watery (more than fatty) food products

**Operations**
waste reuse

**Solutions for short comings**
use of natural dyes / natural colorants for food, cosmetics, pharma
use of waste, by-products
replacement of tartrazine, curcumine for watery matrices

What can it NOT be used for?

**Products**
fatty food products

**Operations**
Any other than waste reuse and/or dye extraction

**Other limitations**
the POP dye is not fat-soluble (1)
Maximum yield for POP (84%) is obtained only after 47 h of enzymatic reaction, the colourless precursor being the major contaminant (12%) (2)

**Risks or hazards**
Safety under assessment

Implementation

**Maturity**
The production process is internationally patented, and licenses are available through INRA Transfert. No license has been exploited so far (December 2012)

**Modularity/Implementation**
This technology can replace the existing water-soluble yellow dyes for food applications.

**Consumer aspects**
Interest for natural products

**Legal aspects**
The production process is internationally patented: WO2005/049598 (2005)
Safety under assessment
General legislation for dyes in food applications: EU directive 94/36/EC, EU regulation 1333/2008

**Environmental aspects**
Use of waste.
Enterzymatic reactions occur at low temperature compared to conventional chemical reactions, with no other solvent than water.

Facilities that might be interesting for you

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Further Information

**Institutes**
INRA - URC BFL

**Companies**
INRA Transfert
References


