

SAFFRON

Prepared at the 29th JECFA (1985), published in FNP 34 (1986) and in FNP 52 (1992). Metals and arsenic specifications revised at the 59th JECFA (2002). Regarded as food ingredient rather than food additive at 29th JECFA (1985)

SYNONYMS

Crocus, French Saffron, Spanish Saffron, Safran, Keshar, CI Natural Yellow 6, C.I. (1975) No. 75100

DEFINITION

Saffron is the dried stigma of flowers of *Crocus sativus* L.

Chemical names

The main colouring matters are crocin: 8,8'-diapocarotene-8,8'-dioic acid bis (6-O-β-D-glucopyranosyl-D-glucopyranosyl ester, and crocetin: 8,8'-diapocarotene-8,8'-dioic acid.

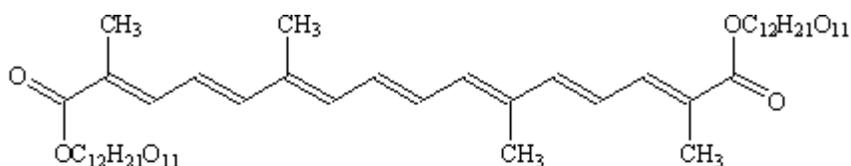
C.A.S. number

42553-65-1 (Crocine)
27876-94-4 (Crocetin)

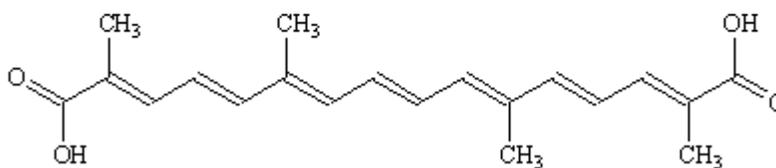
Chemical formula

C₄₄H₆₄O₂₄ (Crocine)
C₂₀H₂₄O₄ (Crocetin)

Structural formula



Crocine



Crocetin

Formula weight

976.70 (Crocine)
328.41 (Crocetin)

Assay

Saffron normally contains between 4-6% crocin and crocetin, as specified by the vendor.

DESCRIPTION

Golden yellow or brown powder, filaments or cake; characteristic odour. Information is required on methods of analysis for ash insoluble in dilute HCl, and water insoluble matter.

FUNCTIONAL USES

Colour, flavouring agent

CHARACTERISTICS

IDENTIFICATION

Colour in solvents

Saffron macerated with water imparts a yellow colour in the aqueous phase.

It gives a pale yellow colour to ether or petroleum ether.

<u>Identification of colouring matters</u>	Passes test See description under TESTS
<u>Colour comparison</u>	0.1 g macerated for 3 h at ambient temperature in 50 ml water and filtered, gives a yellow colour of the same shade and intensity as a solution of 0.275 g of chromic anhydride dissolved in the same amount of water.
PURITY	
<u>Loss on drying</u> (Vol. 4)	Not more than 14% (105° to constant weight, about 4 h)
<u>Spectrophotometry</u> (Vol. 4)	Absorption spectrum of saffron in methanol has maxima at 435, and 250 nm.
<u>Total ash</u> (Vol. 4)	Not more than 8%
<u>Water insoluble matter</u> (Vol. 4)	Not more than 45% Information required on method of analysis
<u>Acid insoluble ash</u>	Not more than 1% (dilute HCl) Information required on method of analysis
<u>Thin layer chromatography</u>	Spot 20 µl of 5% aqueous extract of the sample on a silica gel G plate, using a mixture of n-butanol, acetic acid and water (4:1:2 by volume) as developing solvent. Identify the yellow spots of crocin (or crocetin, if any) with a genuine sample of saffron. No other spots are observed.
<u>Nitrogen</u> (Vol. 4)	Not more than 2%
<u>Synthetic dyes</u>	Basic dyes: To 1 g of the sample add 100 ml of 1% sodium hydroxide solution, and mix well. Extract 30 ml of this solution with 15 ml of ether. Then extract the ether layer twice with dilute acetic acid (5 ml); the dilute acetic acid layer does not contain any colour. Other acidic dyes: To 1 g of the sample add 1 ml of ammonia TS and 8 ml of water, and shake well. Discard an oily layer when separated. Proceed as directed under <i>Paper Chromatography (Ascending Chromatography)</i> using 2 µl of the solution as the sample solution, and a mixture of pyridine and ammonia TS (2:1 by volume) as the developing solvent. Stop the development when the solvent front has advanced about 15 cm from the point of application. No spot is observed at the solvent front after drying under daylight. If any spot is observed, it should be decolourized when sprayed with a solution of stannous chloride in hydrochloric acid (2 in 5).
<u>Arsenic</u> (Vol. 4)	Not more than 3 mg/kg
<u>Lead</u> (Vol. 4)	Not more than 2 mg/kg Determine using an atomic absorption technique appropriate to the specified level. The selection of sample size and method of sample preparation may be based on the principles of the method described in Volume 4, "Instrumental Methods."

TESTS

IDENTIFICATION TESTS

Identification of colouring matters

1. Sulfuric acid produces with the sample a blue colouration which gradually changes to violet, cherry-red finally to brown.
2. To a solution of 0.1 g of diphenylamine in 20 ml of sulfuric acid and 4 ml of water in a shallow porcelaine dish, add a small amount of the sample. The immediate colouration produced is blue, which turns rapidly to brown-red. In presence of nitrates the blue colouration persists. (The artificial colours generally produce an intense red or orange colour and the substitutes of saffron do not produce the blue colour). Allow the nitrated preparation to stand for a minute, cover it with a cover slip, and remove the excess of liquid with a piece of filter paper. Examine under the microscope first at a magnification of 50x then at 100x. The sample is coloured blue-green. The grains of pollen take a blue tint and their diameter appears increased.
3. Boil 200 mg saffron in 200 ml of 1% KOH for 2 min, cool, acidify with dil. H_2SO_4 , add 50 ml benzene and shake vigorously. Wash benzene extract free of acid and dry over anhydrous Na_2SO_4 . Identify crocetin by adsorption on column of alumina. Crocetin is adsorbed strongly and forms a band of brilliant yellow which is not eluted by benzene, petroleum ether, chloroform, acetone, ethyl and methyl alcohols. After clearing the column with benzene and then chloroform, 5 ml of Carr-Price reagent turns the band violet.

Absorption spectrum with methanol as in the figure has maxima at 435, and 250 nm.

