

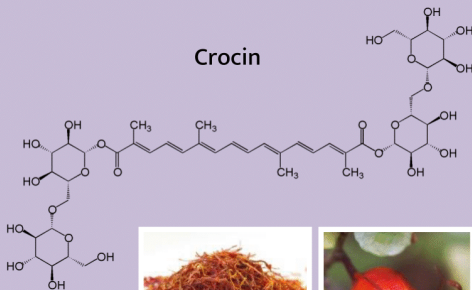


CROCIN*

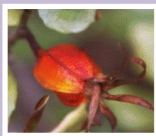
Molar Mass : 976.972 g mol⁻¹

Melting point : 186 °C

Crocin



Saffron



Gardenia

Crocin is the principal colouring compound in saffron, found in the stigmas of the *Crocus sativus* flowers. The deep yellow/ orange colour, characteristic of saffron is primarily due to the presence of crocetin and crocin. It was commonly used in the past for dyeing silk and cotton.

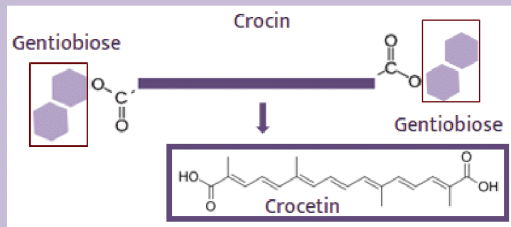
Crocin, has also been discovered in the fruits of *Gardenia jasminoides*. Since gardenia is much less expensive to cultivate than saffron, it is currently being researched as an economical saffron-dye substitute.

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<https://chem.hbcse.tifr.res.in/>

*Not to be confused with the paracetamol tablets

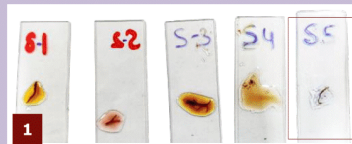
Chemistry of Crocin

Crocin is a carotenoid, primarily made up of a dicarboxylic acid, Crocetin linking two units of a disaccharide (double sugar) — gentiobiose. Crocin is also called di-gentiobiose ester of crocetin.



Crocin can be isolated as a deep red coloured crystalline compound. It is sparingly soluble in absolute alcohol, ether, and other organic solvents. However, when dissolved in hot water, it produces an intense orange-coloured dye.

The conjugated chains of double bonds are responsible for the colouring properties of crocin and crocetin. They give a blue colour on reaction with sulphuric/nitric acid as a result of ester hydrolysis. This rapid test is one of the common techniques used to distinguish real saffron from the fake ones which produce yellow or red colour with sulphuric/ nitric acid.



True saffron giving blue colour with sulphuric acid

Preparation of natural dye



In India, *Crocus* flowers are typically harvested early in the morning. The stigmas separated from the flowers are air-dried under shade or dried using a warm furnace.



Crocin was traditionally extracted by boiling the dried stigmas in water. Techniques like crystallization, chromatography etc. are used to obtain samples with higher purity level.



Safflower

Owing to high cost, true saffron is often replaced by or adulterated with American saffron i.e, safflower - (*Carthamus tinctorius*).

Do you know???

Approximately 2,50,000 *Crocus sativus* flowers are needed to produce roughly 1.5 kg of fresh stigmas; which when dried reduces to 1 kg. Saffron is one of the world's most expensive spices and also known as "red gold".

Dyeing with Crocin

Crocin is a substantive (direct) dye that can be used on cotton, linen, silk and wool. It does not require mordant since the size of the molecule itself helps it to associate with the fibre. Crocin produces a strong yellow colour on the dyed fabric.

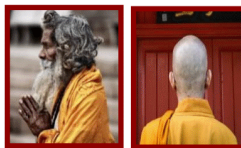


The dye colour is fugitive. Hence, the fabric will have to be boiled with a few grains of saffron every once in a while, to keep it bright.

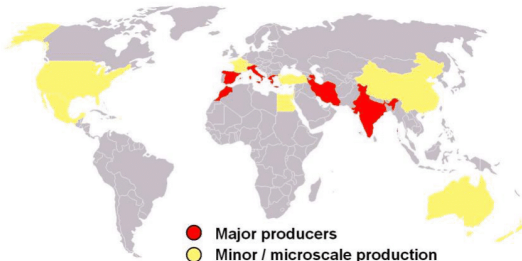


Bright light, particularly sunlight, may cause the dye to fade more rapidly. Likewise, hot water tends to wash out direct dyes. Hence, clothes dyed in saffron needs to be washed gently in cold water or dry-cleaned.

The monks who wear robes dyed with saffron, redye their robes every year. Since saffron is very expensive, turmeric is also used for dyeing robes since it is a less expensive natural substitute.



In India, saffron is primarily used as a natural food colour, spice and condiment in a wide range of delicacies. The Kashmiri "Mongra" or "Lacha" saffron (*Crocus sativus 'Cashmirianus'*), is known for its extremely dark maroon-purple hue, among the world's darkest varieties, with strong flavour, aroma and colourative effect.



At present, Iran is the highest producer of saffron in the world, followed by Greece, Morocco, India, Azerbaijan, Spain, Italy, Afghanistan etc.

Cultivation, harvesting and processing of saffron are labour intensive processes and it creates employment opportunities for the local people, especially the women. Climate change and political turmoil in areas where saffron is grown are consequential to hike in prices as demand for it continues to grow.

The Saffron war

During 1347-1350 A.D, the demand for saffron spiked in Europe due to its presumed medicinal applications in an attempt to treat the Bubonic Plague. However, many of the farmers that grew *Crocus sativus* had died from the disease and the demand far exceeded the supply. The trade of saffron became of such significance that those found guilty of adulterating supplies were fined, imprisoned and even executed.

Large quantities of non-European saffron began to be heavily imported to central and northern Europe. A greater portion of it had to be imported via Venetian and Genoan ships from southern and Mediterranean lands such as Rhodes. The theft of one such shipment (en route to Basel, Switzerland) by wealthy aristocrats sparked the fourteen-week long "Saffron War" until the shipment was returned. But saffron trade continued to be plagued with thieves during this period to an extent where pirates would choose ships loaded with saffron over ships containing gold.

Other uses of Crocin



Saffron based dyes were also used in paintings. Crocin is also used in numerous pharmacological research studies related to cancer, heart disorders, mental health, ocular diseases, arthritis, antioxidant properties etc.

References and Further Reading-

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Now, can you find?

- What are the common malpractices adopted by people during saffron processing and trade?
- What are the techniques used to detect the presence of adulterants in saffron?
- Can saffron be synthetically produced?