

Saffron

A Review by John C. Leffingwell, Ph.D.

This a part of our series on aroma materials produced by carotenoid degradation.

Saffron is considered to be the worlds most expensive spice. The flower of *Crocus sativa* is a light purple, but it is the thread-like reddish colored stigma of the flower that is valued both as a spice and as a natural colorant. Saffron is hand harvested in the autumn, and the stigma is laboriously separated to yield the reddish colored spice. It takes in excess of 70,000 flowers to yield just one pound (0.45 kilo) of saffron spice. The odor of saffron is sometimes described as like the "sea" air. The natural color is a powerful yellow in applications such as for saffron rice.



Saffron Flower

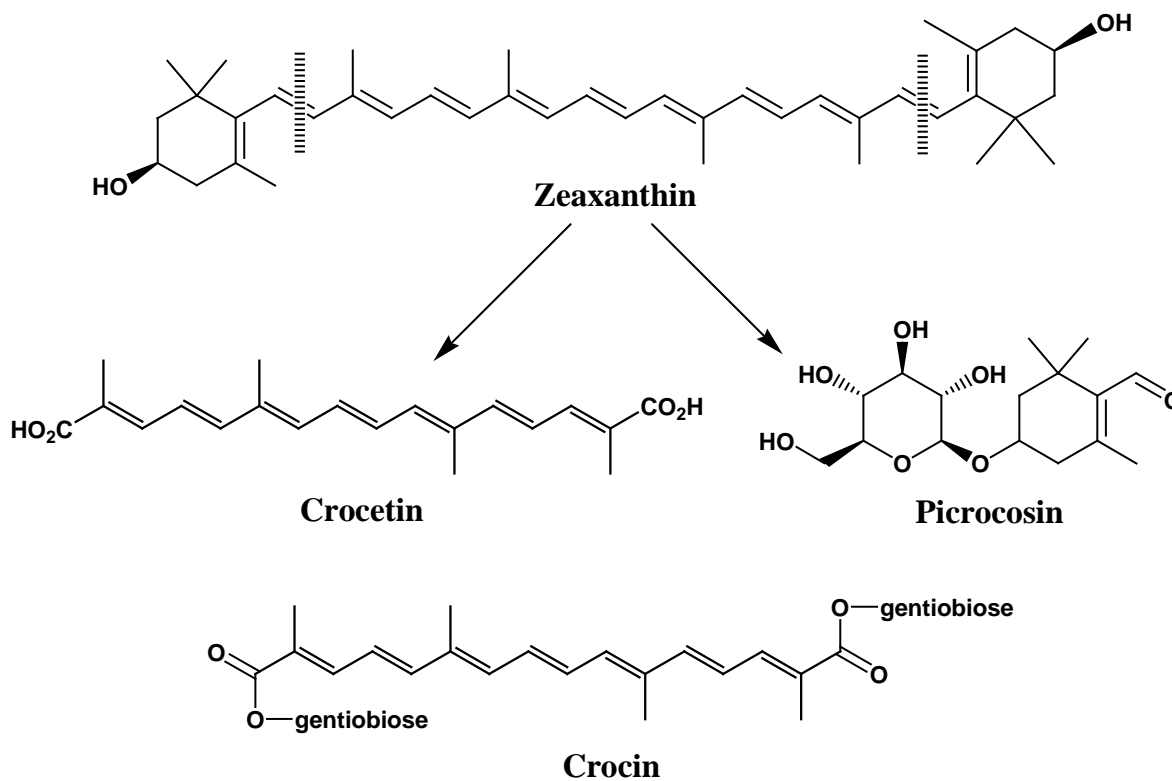


Saffron being Harvested

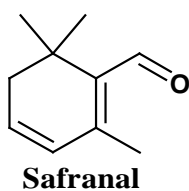


Separation of the colorful stigma

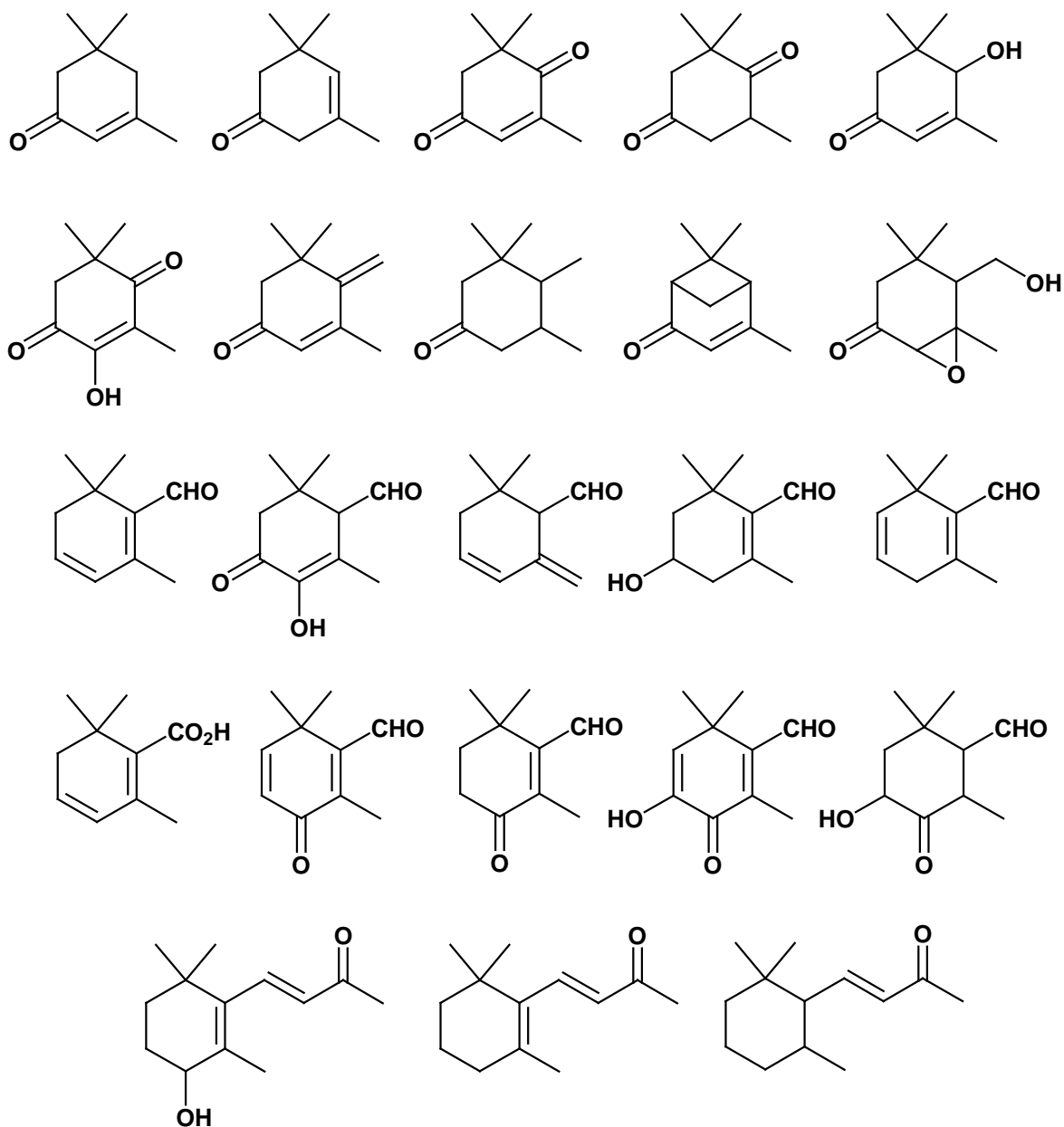
While the color is mainly due to the degraded carotenoids (crocin and crocetin), the flavor comes from the carotenoid oxidation products (mainly safranal and the bitter glucoside picrocrocin). It was proposed by Pfander & Schurtenberger (1982) that the biogenesis of the color principles and odor active compounds is derived by bio-oxidative cleavage of Zeaxanthin at the points indicated.



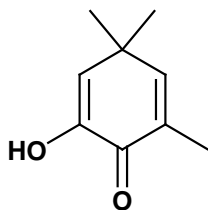
As mentioned, the major organoleptic principle present is "Safranal" [2,6,6-Trimethylcyclohexa-1,3-dien-1-carboxaldehyde], which is easily formed by de-glucosylation of picrocrocin. Safranal composes as much 70% of total volatiles.



Among the other carotenoid derived volatiles found by various workers (see references below) are the following materials:



In a series of analyses carried out in 1997 (comparing various methods of volatiles isolation), Tarantilis and Polissiou implied that some isolates may be artifacts formed during a steam distillation isolation procedure. In their studies they confirmed that Safranal was the major component, comprising about 70% of total volatiles. Cadwallader, et al., in 1997 reported on the aroma dilution analysis of saffron volatiles and found that a minor component, 2-Hydroxy-4,4,6-trimethyl-2,5-cyclohexadien-1-one (also isolated by Tarantilis and Polissiou from steam distillation of Greek red saffron), was the most powerful aroma constituent of saffron, followed by safranal. Its odor was described as "saffron, dried hay like".



2-Hydroxy-4,4,6-trimethyl-2,5-cyclohexadien-1-one
Aroma: saffron, dried hay like

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